DOCUMENT RESUME

ED 187 870 CE 025 206

TITLE	Performance Based Curriculum Development for Disadvantaged and Handicapped Students. Final Report [and] Modules.
INSTITUTION	Purdue Univ., Lafayette, Ind.
SPONS AGENCY	Indiana State Board of Vocational and Technical Education, Indianapolis.
PUB DATE	2 Apr 80
NOTE	341p.
EDRS PRICE	MF01/PC14 Plus Postage.
DESCRIPTORS	*Auto Mechanics; Competency Based Education; Course Content; *Curriculum Development; Curriculum Guides; *Disabilities; *Disadvantaged Youth; *Horticulture; Instructional Materials; Secondary Education
IDENTIFIERS	Vocational Technical Education Consortium States

ABSTRACT

This project was undertaken to develop a model for the construction of curriculum material using Vocational Technical Consortium of States (VTECS) occupational information as the primary background source. Each instructional package developed related to one specific task listed in the VTECS catalog and was totally self-contained. The packages were along a tri-modal approach: i.e., teacher centered, student centered, or a combination of the two. The student-centered component was designed for use by disadvantaged and handicapped students with low reading ability, short attention spans, or with problems in abstract comprehension and reasoning. Among the findings reported was that the tri-modal approach was an improvement over either teacher-centered or student-centered material in that it allows the teacher the flexibility to teach the material conventionally, has students work individually or in small groups, or uses the activity sheets to supplement conventional instruction. (Appended to the document are the twenty modules developed in horticulture and auto mechanics). Some representative titles are (1) Transplanting Annuals, (2) Reseeding Established Lawns, (3) Repairing Damaged Bark, (4) Protecting Trees from the Weather, (5) Check Coolant Freezing Point, and (6) Remove and Replace the Air Cleaner Shell. (LRA)

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FINAL REPORT

PERFORMANCE BASED CURRICULUM DEVELOPMENT FOR DISADVANTAGED AND HANDICAPPED STUDENTS

William G. Camp

SBVTE Project #276-78-III-3

PURDUE UNIVERSITY
WEST LAFAYETTE, INDIANA

April 2, 1980

State Board of
Vocational and Technical Education
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II. INFORMATION SHEET

Project population

Groups	Number of Persons: Impacted by Project	Number of Persons: Conducting or Giving Input
Students		
secondary	0	100
post secondary	0	0
adult	0	0
School personnel		
secondary	0	10
post secondary	0	0
adult	0	0
Other		
teacher educators	0	4
employers	0	0
employees	0	0
special consultant	0	1
graduate research assistant	0	3
Special needs		
disadvantaged	0	70
handicapped	0	30
migrant	0	0
minority	0	15
limited English proficiency	0	0

III. STATEMENT OF OBJECTIVES

The objectives of the project were to:

1. identify and secure state board staff approval of a minimum of twenty (20) sets of existing PBVE curriculum material for modification;
2. develop a systematic model for modifying the selected existing PBVE materials set into PBVE learning packages for disadvantaged and handicapped students;
3. develop a format for the packages;
4. produce the PBVE packages;
5. field test the PBVE learning packages with disadvantaged and handicapped students in live classroom settings;
6. revise the packages as indicated by the results of the field tests; and
7. submit a camera-ready copy set of the packages to the Indiana Curriculum Materials Center for reproduction and dissemination, as appropriate.

IV. STATEMENT OF PURPOSE

This project was undertaken to develop a model for the construction of curriculum material using VTECS occupational information as the primary background source. It was proposed that the materials would be developed as separate packages, each relating to one specific task listed in the appropriate VTECS catalog. It was further proposed that each package be totally self-contained, requiring no outside reference or audio-visual materials. The packages were to be designed along a tri-modal approach: i.e. teacher-centered, student-centered, or a combination of the two. The student-centered component was to be designed for use by disadvantaged and handicapped students with reading ability of roughly fourth to fifth grade levels, with short attention spands or with problems in abstract comprehension and reasoning. The teacher-centered component was to be directly implementable into the classroom without requiring extensive additional research or curriculum development on the part of the individual teacher user.

V. PROCEDURES

1. The first determination made was that packages would be developed for field testing in two occupational areas: horticulture and auto mechanics.
2. Copies of the VTECS task analysis catalogs completed for those areas were secured. Since several occupational catalogs were available in the area of horticulture, one was selected for use in the project (i.e. Gardening and Groundskeeping) along with the Auto Mechanics catalog.
3. Project staff members selected from those two documents twenty individual tasks for development into curriculum packages. Since the purpose of this project was more directed toward procedural development and model building than the actual construction of a mass of instructional material, a "shotgun" approach to task selection was used. In other words, the tasks were selected almost on a random basis with no particular logical connection between tasks and with no attempt to group the tasks by duty area or in chronological order.
4. The list of selected tasks was approved by Mr. Ed Hornback of SBVTE.
5. The model for each package was developed and validated as a group project by all participating staff members with the first package (hereafter referred to as a module) being produced and field tested in an operating program for handicapped (EMR) students in a horticulture program and using the special education coordinator for that program as a consultant to the project.
6. The format of the module was adjusted according to the results of that initial field trial and that module and one module for auto mechanics were then developed using the revised format and subsequently field

tested. Those modules were then revised and served as the basic pattern for subsequent module development.

7. The module format finally accepted was as follows: (See modules appendix 2 through 21).

   a. Cover Sheet

      (1) Job Title
      (2) Duty
      (3) Task
      (4) Activities

Items (1) through (3) are taken directly from the VTECS catalog. Item (4) is based on the VTECS task performance guide but may not precisely duplicate the source document.

   b. prerequisite skills and knowledge

      Listed here are those student abilities which are assumed. It is suggested that the teacher might review or teach those skills and knowledges before this module is used.

   c. vocabulary words

      Any terms appearing in the module which might cause problems for low reading ability students are listed.

   d. curriculum guide

      (1) unit of instruction - the unit titles correspond exactly with the activities listed on the cover sheet.
      (2) student objectives
      (3) suggested learning activities
      (4) evaluation
      (5) tools, equipment and supplies required

   e. activity sheets

      Each activity listed on the cover sheet (and each unit listed in the curriculum guide) has an associated activity sheet. The activity sheet relies minimally on reading and utilizes diagrams and drawings whenever possible.

(1) GET:

A "GET" list shows the student what materials are required to complete the activity. This corresponds to the tools, equipment, and supplies column of the curriculum guide.

(2) DO:

The "DO" section provides a step-by-step guide for student completion of the activity. This component of the activity sheet typically provides for the accomplishment of a single step in the performance guide of the task analysis from the VTECS catalog source document.

(3) NOW:

The "NOW" section provides for feedback to the student or evaluation of the completed task. It typically corresponds to the evaluation column in the curriculum guide.

(4) NEXT:

This section provides the student with directions as to the succeeding activity in the module - typically, it will direct the student either to begin a subsequent activity sheet or to consult the teacher for instructions.

f. overhead masters

For the teacher who elects to utilize the curriculum guide for teacher-centered instruction, overhead masters are provided to correspond with the suggested activities column in the guide.

8. In the next phase of the project, the set of twenty modules was to be completed. Unexpected delays allowed only ten to be finished in time for full field testing, however,

9. Ten teachers were utilized for field testing the first ten modules during April 1979. An evaluation instrument was used to collect teacher reactions to the materials, (see Appendix 1).

10. As a result of the field test, minor revisions were made in most of the tested modules.

11. Based on the experiences gained in the development and field-testing of the first ten modules, the remaining ten were somewhat easier to develop.

11. The last ten modules were submitted for teacher review, in lieu of field testing.

13. The latter modules were modified as indicated.

14. The twenty module originals will be delivered to ICMC as camera copy, with a copy of this final report.

15. Thirty sets of each module were printed for distribution to participants in the project and as appendices to this final report, (see Appendix 2 through 21).

VI. ANALYSIS PROCEDURES

(Omitted)

VII. FINDINGS

1. The tri-modal approach is an improvement over either teacher-centered or student-centered (i.e. conventional or individualized) material in that it allows the teacher the flexibility to teach the material conventially, have students work individually or in small groups using only the activity sheets, or use the activity sheets to supplement conventional instruction.
2. Among the ten field-test teachers, at least one preferred each of the three modes of potential use.
3. All the teachers agreed that such material was needed for their D & H students.
4. Nine of the ten teachers felt the material could fit into their programs.
5. All ten felt that the tri-modal module approach was superior to textbooks or workbooks for their own use.
6. On the other hand, all of the auto mechanics teachers involved felt that the materials might not be appropriate for use on an individual basis by D & H students. The feeling was that the tasks themselves were not amenable to individualized instruction with the targeted student population.
7. The modules for the horticulture program were all well received and generally considered quite useful in all three modes for the target population.
8. The auto mechanics modules were well received for use in the teacher-centered mode or in the combination mode for D & H students. Some difficulty was experienced with the activity sheets because of the complex nature of the tasks and because of the necessity to prepare intricate,branched routes under each task.

9. Another difficulty with developing activity sheets for auto mechanics tasks, was that the precise model and make of car had to be specified in each case. For instance, conducting an engine compression test differs from one car manufacturer to another, differs from one year to the next, and differs by size of engine.
10. In general, the approach used was considered very appropriate and successful for the horticulture area; but was somewhat less successful in the auto mechanics area.

VIII. EVALUATION OF PROJECT

The developmental model works very well. Use of the VTECS performance guides and tasks provides an extremely powerful and meticulously validated basis for curriculum development. This evaluation must be tempered with a recognition that certain technically sophisticated areas may not be as easy to work with as others in the development of self-contained individualized instruction materials designed specifically for use by D & H (low reading level) students.

IX. CONCLUSIONS AND RECOMMENDATIONS

1. All objectives of the project were successfully met.
2. The tri-modal module approach is an improvement over either conventional curriculum materials or individualized instruction materials.
3. Auto Mechanics tasks may be a difficult area in which to develop low reading level, short duration individualized instruction materials.
4. This model works very well with regular students also.

5. Further expenditure of developmental monies in producing such materials for horticulture would be a good investment for D & H students.
6. Further expenditure of developmental monies in producing such materials for auto mechanics would be a good investment for regular students.
7. Such materials would be most useful in occupational areas where the learning content is less variable and less dependent upon chance than is auto mechanics.
8. Most of the teachers involved were enthusiastic in desiring the expansion of curriculum development along this line.

X. FINANCIAL STATEMENT

(Attached)

XI. SUPPLEMENTAL AND APPENDIX

(Separate cover)

XII. ABSTRACT

(Attached)

Financial Statement will be forwarded separately from Purdue University Contracts Office.

FINAL REPORT ABSTRACT

A. The POCESS/PRODUCT(S) to be adopted/adapted and delivered by this project are:

1. a model for the adaption of existing PBVE materials for use as curriculum material to assist teachers in the instruction of special needs vocational students;
2. twenty PBVE modules for use as curriculum material in the instruction of special needs vocational students.

B. The specific objectives of the project are to:

1. identify and secure state board staff approval of a minimum of twenty (20) sets of existing PBVE curriculum material for modification;
2. develop a systematic model for modifying the selected existing PBVE materials set into PBVE learning packages for disadvantaged and handicapped students;
3. develop a format for the packages;
4. produce the PBVE packages;
5. field test the PBVE learning packages with disadvantaged and handicapped students in live classroom settings;
6. revise the packages as indicated by the results of the field tests; and
7. submit a camera ready copy set of the packages to the Indiana Curriculum Materials Center for reproduction and dissemination, as appropriate.

C. The procedures for achieving these objectives are:

1. Secure copies of existing materials. Select twenty tasks for development into modules. Secure approval of proposed list of modules by consulting with appropriate state board staff member.

2. Consult with a teacher currently operating with students in the target population. Develop a format for a trial module.
3. Develop a trial module using VTECS as the source document. Field test the module and revise it accordingly.
4. Produce ten modules for field test.
5. Secure ten teachers with special needs students. Provide modules for the teachers to field test. Secure teacher reactions.
6. Utilize the field test results to revise the ten modules and as a basis for development of the remaining modules.
7. Submit offset copies with the final report. Submit originals to ICMC as camera-ready copy.

D. Expected impacts on vocational education are:

1. The tri-modal approach tested is an improvement over either conventional or individualized curriculum material.
2. The developmental model and product format could be used quite effectively for the organized production of curriculum material for entire courses in selected areas.
3. The modules actually produced will have little use in the field at this point because of the extremely limited nature of the project.
4. The modules could be used quite effectively; however, much more extensive development would be needed before real impact would be felt.
5. Subsequent development of materials should be much less expensive and time-consuming, since the most difficult part of this project was not the production of modules, but, rather, was the perfection and testing of the model and format.

Appendices

1. Field Test Evaluation Form
2. Module: Transplanting Annuals
3. Module: Pruning and Trimming Trees
4. Module: Reseeding Established Lawns
5. Module: Transplanting Trees
6. Module: Preparing a Compost Pile
7. Module: Repairing Damaged Bark
8. Module: Pruning and Trimming Shrubs
9. Module: Protecting Trees from the Weather
10. Module: Measuring the Cylinder Compressions and Determining the Condition of the Valves
11. Module: Test, Remove, and Replace the Ignition Contact Set and Adjust the Dwell and Timing
12. Module: Clean, Gap, and Test Spark Plugs
13. Module: Check Coolant Freezing Point
14. Module: Remove and Replace the Air Cleaner Shell
15. Module: Trimming Hedges
16. Module: Edging Flower Beds
17. Module: Thatch Control
18. Module: Service the Battery
19. Module: Inspect and Replace the Air Cleaner Filter Element
20. Module: Check Engine Crankcase Oil Level
21. Module: Check Automobile Tire Pressure

APPENDIX I

SBVTE D & H Curriculum Project (276-78)

Field Test Overall Evaluation

Teacher ______________________________

School ______________________________

Number of students used in field test ______________

Number of D & H students used in field test ______________

General

1. Do you need more curriculum material specifically aimed at your D & H students?

2. Would the type of material field tested fit into your program?

3. Was the module approach more useful than a textbook or workbook approach?

4. Could you use this type of material as a supplementary curriculum for your D & H students if a complete course were developed?

5. Were the students able to perform the steps on the activity sheets?

6. Was the level of complexity of the steps appropriate for your D & H students?

7. Was the reading level appropriate for most of the students?

8. How much of your time was needed to assist your students in using the activity sheets.

9. Of the three modes (teacher-centered, student-centered, and combination) which did you prefer?

10. Of what value was the section on prerequisite skills and knowledge?

11. Of what value was the section on vocabulary words?

12. Of what value was the curriculum guide?

13. Of what value were the activity sheets?

14. Of what value were the overhead masters?

15. General Comments:

Field Test Evaluation for
Individual Module

MODULE TITLE ____

1. Was the task appropriate for your D & H students?

2. Prerequisite skills:

   a. Did you teach or review any of the skills listed?

   b. Should modules be provided for the skills listed?

   c. How did you utilize the list?

3. Vocabulary:

   a. What words should be added?

   b. What words should be deleted?

   c. How did you utilize the list?

4. Curriculum guide:

   a. Were the units of instruction appropriate?

   b. Were the objectives clear and appropriate?

   c. Were the learning activities useful and appropriate?

4 d. What other learning activities would you suggest?

5. What comments do you have on Activity Sheet # _________?

6. Activity Sheet # ________?

7. Activity Sheet # ________?

8. Activity Sheet # ________?

9. Activity Sheet # ________?

10. Activity Sheet # ________?

11. Activity Sheet # ________?

12. Activity Sheet # ________?

13. Activity Sheet #_________?

14. Activity Sheet # ________?

15. Were the transparencies appropriate and useful?

16. General comments on the module:

18/7

Appendix 2

JOB TITLES: Gardening
Groundskeeping

DUTY: Maintaining Plants

TASK: Transplanting Annuals

ACTIVITIES:

1. Planning the Arrangement
2. Preparing the Annual Bed
3. Laying Out the Bed
4. Setting Out Plants

PREREQUISITE SKILLS AND KNOWLEDGE

This module on transplanting annuals will give students actual experience in an area of gardening and groundskeeping. While the purpose of the unit is teaching students, there are prerequisite skills and knowledge which should precede the unit. A list of these skills follows:

1. knowledge of color harmony
2. use of spade, hammer, trowel
3. use of yardstick

VOCABULARY

The teacher should review these words with the student:

TRANSPLANTING

ARRANGEMENT

ANNUAL

BEDS

HARMONY

CLASH

PREPARING

FERTILIZER

COMPOSTED

STRAIGHT

HAND TROWEL

SOIL SOAKER

DEPTH

A CURRICULUM GUIDE FOR

Transplanting Annuals

Unit Of Instruction	Student Objectives	Suggested Learning Activities
Planning the Arrangement	Given a pencil and paper, the student will be able: 1. to demonstrate understanding of proper height and color placement of annuals.	1. Discuss with students why annual beds should be planned before planting. 2. Explain why it is important to know which plants will grow tall and which will remain short. 3. Have students talk about colors which do not go together. 4. Show students examples of well planned beds in the community. 5. Use Activity Card TA 1. 6. Have the students build a mock-up of an annual bed, or draw a color illustration.
Preparing the Annual Bed	Given work gloves and a garden spade, the student will be able: 1. to understand why annual beds are spaded and fertilized. 2. to successfully spade a bed in preparation for planting annuals.	1. Discuss with the students reasons for adding fertilizer or composted material to an annual bed. 2. Explain to the student why work gloves are needed. 3. Demonstrate correct use of the spade, and show the students how to add fertilizer. 4. Use Activity Card TA 2.

Evaluation	Tools, Equipment and Supplies
1. correct answers on Activity Card 2. teacher observation	1. paper 2. pencil
1. teacher observation	1. work gloves 2. garden spade

Unit of Instruction	Student Objectives	Suggested Learning Activities
Laying out the Bed	Given wood stakes, twine, and a yardstick, the student will be able: 1. to successfully follow a plan for planting when preparing an annual bed.	1. Review measuring with a yardstick. 2. Explain to the students how to interpret the planting plan they will be using. 3. Demonstrate laying out and marking a row in preparation for planting. 4. Use Activity Card TA 3.
Setting Out Plants	Given a hand trowel, annual plants, and a soil soaker, the student will be able: 1. to successfully transplant annuals	1. Demonstrate the correct use of the hand trowel. 2. Discuss why different types of containers are used with annuals. 3. Let the students practice removing plants from the various container types. 4. Explain use of the soil soaker. Have the students discuss other methods of watering. 5. Use Activity Card TA 4.

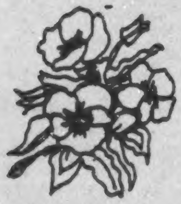
Evaluation	Tools, Equipment and Supplies
1. teacher observation	1. wood stakes 2. twine 3. yardstick
1. teacher observation	1. hand trowel 2. annual plants 3. soil soaker

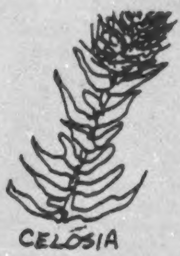
Planning the Arrangement

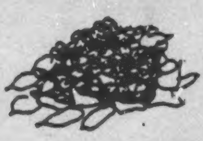
GET: paper
pencil

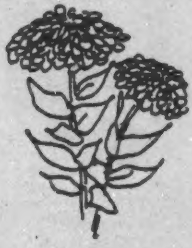
DO: 1. We plan annual beds so that flowers will be planted where they look best. Usually, tall plants are placed in the rear, or in the center of island beds. Smaller plants are put in front. Color harmony should also be checked. If colors clash, white flowers can be planted in between.

2. Look at these plants. Which plants should be placed in the rear of the bed? Write the answer on your paper.

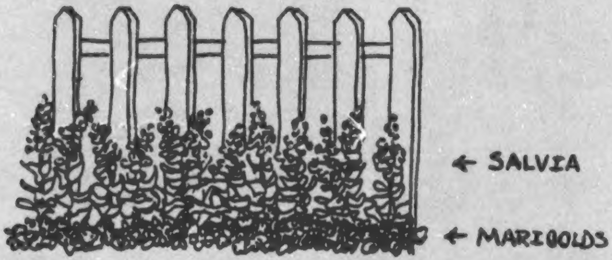








3. Look at these plants. Should they be planted next to each other? Write why or why not on your paper.



4. List on your paper two things we think about when planning annual beds.

NOW: 1. Have your teacher check your answers.

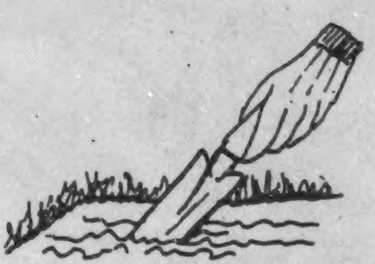
NEXT: Go to Activity Card TA 2

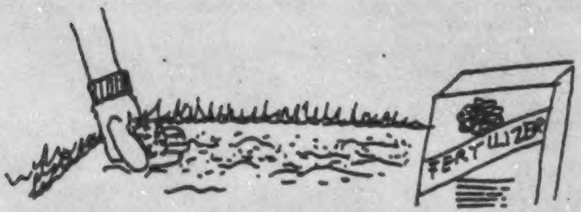
Preparing the Annual Bed

GET: garden spade
work gloves

DO:

1. Sometimes when we prepare annual beds, we may add fertilizer or composted material. Check with your teacher to see if you will be adding something to the soil.
2. Gather the materials you will need and take them to the bed.
3. Put on your work gloves.
4. Use your spade to turn over the soil in the bed. It is better to start in one corner and spade in rows.
5. Add fertilizer when your teacher decides your bed is ready.





NOW: 1. Have your teacher check your work.

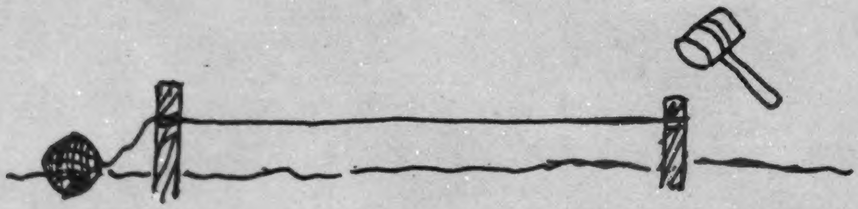
NEXT: Go to Activity Card TA 3.

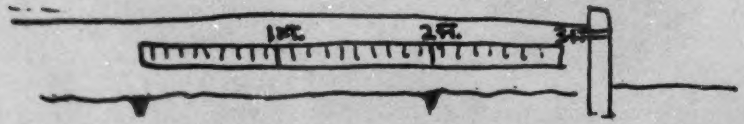
Laying Out the Bed

GET: wood stakes
twine
yardstick
hammer

DO:

1. Check with your teacher for the plan for the annual bed you will be planting.
2. Gather the materials you will need and take them to the bed.
3. If straight lines of annuals are to be planted, stakes and twine should be used as a guide. Pound the stakes into the ground at each end of the rows. Tie the twine between the stakes.
4. Check with your teacher to decide how close together the plants should be.
5. Use your yardstick to measure the distance between plants. Make a light mark in the soil where the plant should go.





NOW: 1. You are ready to start planting.

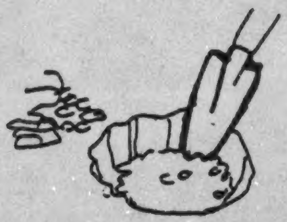
NEXT: Go to Activity Card TA 4

Setting Out Plants

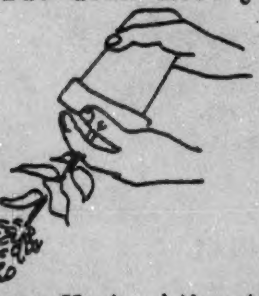
GET: hand trowel
soil soaker
annual plants

DO: 1. Annuals should be watered at least two hours before transplanting. Check to see that the plants are ready.

2. Go to a spot you have marked for a plant. Use your trowel to dig a small hole deep enough for the roots.

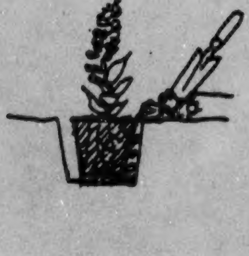


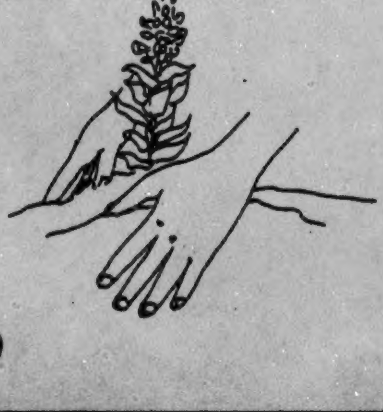
3. If the plant is in a pot, hold it in one hand and place your other hand over the plant. The stem and leaves should be between your fingers. Carefully dump the plant upside down into your hand.



4. If the plant is in a flat with other plants. carefully separate it. Lift out the plant, roots and soil around the roots.

5. Set the plant in the prepared hole. Use your trowel to push soil around the plant. Make the soil firm by pressing lightly with your hand.

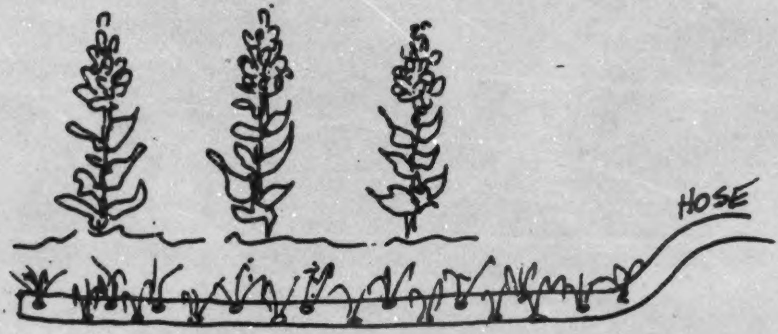




Setting Out Plants
(CONTINUED)

6. When you are finished, the plant should be at the depth where it first grew.

7. Place soil soaker close to plants and water the beds.



NOW: 1. Clean your tools and put them away.

NEXT: See your teacher

Appendix 3

JOB TITLES: Gardening
Groundskeeping

DUTY: Maintaining Plants

TASK: Pruning and Trimming Trees

ACTIVITIES:

1. Determining Why Trees Need Pruning
2. Determining Which Tools to Use
3. Pruning Newly Planted Trees
4. Removing Branches
5. Sealing All Large Cuts and Wounds

PREREQUISITE SKILLS AND KNOWLEDGE

This module on the pruning and trimming of trees will guide the student to learn and perform various tasks. It cannot, however, provide the student with all of the knowledge he needs to successfully master the material. A list of prerequisite knowledge follows:

1. identification and use of pruning shears
2. identification of tree wounds
3. knowledge of proper tree shaping
4. knowledge of double cut procedure
5. knowledge of underlying reasons for pruning newly planted trees

VOCABULARY

The teacher should review these words with the student:

LIMB
PRUNE
ALTERNATE BRANCHING
V SHAPED LIMB
IDENTIFY
LOPPERS
HEDGE SHEARS
PRUNING SAW

REMOVE
BARK
WIDTH
DIAMETER
WATERPROOF
INJURE
TREE WOUND DRESSING
WOUND

A CURRICULUM GUIDE FOR

Pruning and Trimming Trees

Unit Of Instruction	Student Objectives	Suggested Learning Activities
Determining Why Trees Need Pruning	Given a paper, pencil and several trees from which to choose, the student will be able: 1. to identify trees which need pruning. 2. to determine the reasons for pruning. 3. to illustrate trees which need pruning.	1. Review reasons for pruning. 2. Discuss importance of "crotch angle" in removing limbs for strength. 3. Use sample trees and determine their individual needs for pruning. 4. Have students discuss and illustrate reasons for pruning. 5. Have a guest speaker from a local nursery or landscape company talk to the class about the necessity for pruning. 6. Use Activity Card PT 1. 7. Use Overhead Master 1 as a catalyst for class discussion. 8. Have students identify circled areas on Overhead Master 1.
Determining Which Tools to Use	Given pruning tools and a tree to prune, the student will be able: 1. to identify reasons for pruning his assigned tree. 2. to select the proper tools for pruning the tree. 3. to inspect tools to insure working condition.	1. Review names and identification of pruning tools. 2. Display tools in proper and poor condition. 3. Have class make a check list for properly working tools. 4. Have students illustrate which tools should be used for various tasks. 5. Use Activity Card PT 2.

Evaluation	Tools, Equipment and Supplies
1. teacher observation 2. correct answers to question 3 on Activity Card PT 1	1. paper 2. pencil 3. trees for pruning identification
1. teacher observation 2. class discussion	1. pruning tools

Unit of Instruction	Student Objectives	Suggested Learning Activities
Pruning Newly Planted Trees	Given a newly planted tree, the student will be able: 1. to determine the limbs of a newly planted tree which need pruning. 2. to prune a newly planted tree. 3. to prune close to the tree bark without injuring it.	1. Use Overhead Master 2 to show 1/3 tree area for pruning. 2. Have class discuss purpose of pruning newly planted trees. 3. Have class illustrate the problems caused by failure to prune. 4. Use dead twigs for pruning practice. 5. Have student observe and evaluate each other's pruning. 6. Use Overhead Master 3 to demonstrate pruning slant and position. 7. Use Activity Card PT 3.
Removing Branches	Given a tree to prune, pruning tools, and a yardstick, the student will be able: 1. to successfully prune his tree. 2. to use suitable pruning tools for the task. 3. to perform a double cut and understand its purpose.	1. Review use of yardstick in width measurement. 2. Use dead twigs and branches for student practice in pruning. 3. Use Overhead Master 4 for teaching double cut technique. 4. Demonstrate double cut technique on a dead branch or live tree. 5. Show student sample limbs of less than and more than 1 inch. 6. Have students illustrate the double cut, limb widths or purposes of the double-cut. 7. Use Activity Card PT 4.

Evaluation	Tools, Equipment and Supplies
1. teacher observation 2. peer criticism of pruning ability 3. answer to question 1 on Activity Card PT 3	1. paper 2. pencil 3. pruning tools 4. gloves
1. teacher observation 2. answers to questions on Overhead Master 4	1. pruning tools 2. gloves 3. yardstick

Unit of Instruction	Student Objectives	Suggested Learning Activities
Sealing All Large Cuts and Wounds	Given a can of tree wound dressing, a stick, and gloves, the student will be able: 1. to successfully cover all large tree cuts and wounds with tree wound dressing.	1. Discuss the importance of sealing tree wounds. 2. Display and discuss a tree wound which has not been sealed. 3. Have students practice using tree wound dressing on dead limbs. 4. Use Activity Card PT 5.

Evaluation	Tools, Equipment and Supplies
1. teacher observation	1. tree wound dressing 2. a stick 3. gloves

Determining Why Trees Need Pruning

GET: paper
pencil

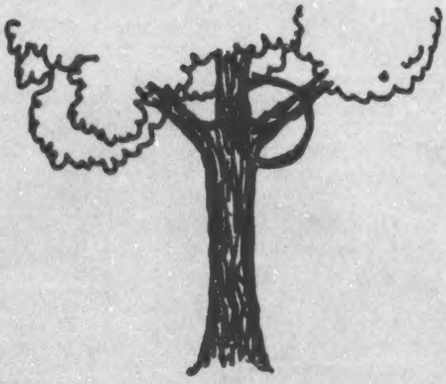
DO: 1. Identify three trees which need pruning. Look at each tree carefully.

2. Remember, you prune a tree to:

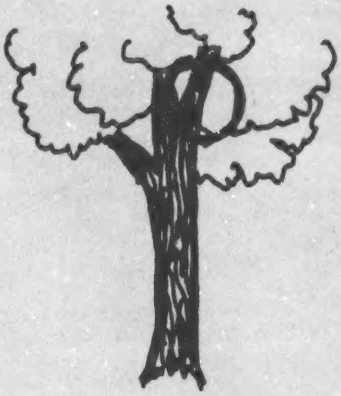
A. make sure that the tree has a nice shape and good growth.

B. remove damaged limbs or limbs that are in the way of buildings or other trees.

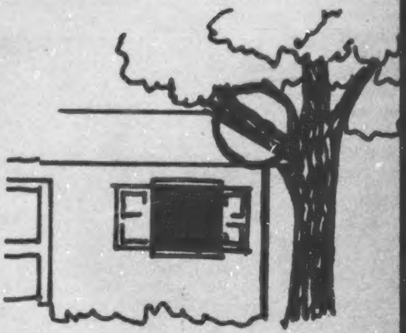
3. List on your paper why each of your trees needs pruning. The A or B will show which group your answer is in.



A - Reason: Tree needs alternate branching



A - Reason: Tree has a V-shaped limb



B-- Reason: Tree limb is rubbin
on the house

NOW: 1. Make sure that you can tell why we prune trees.

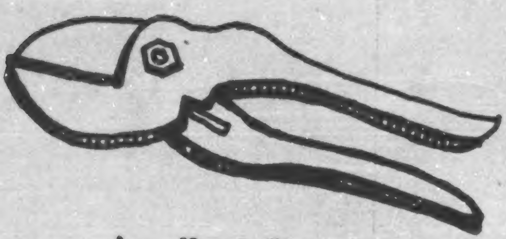
NEXT: Go to Activity Card PT 2.

Determining Which Tools to Use

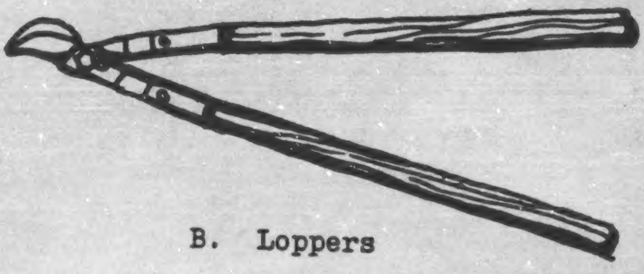
GET: pruning tools

DO: 1. Identify which tree you will prune. Be sure to check with your teacher.

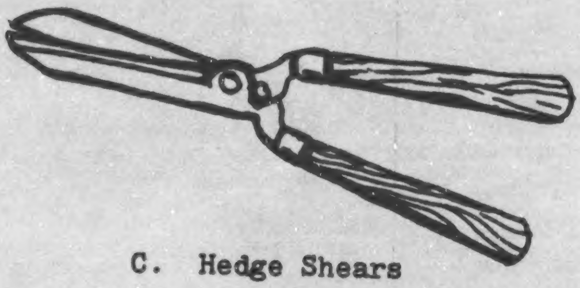
2. Select the tools you will use to prune your tree.



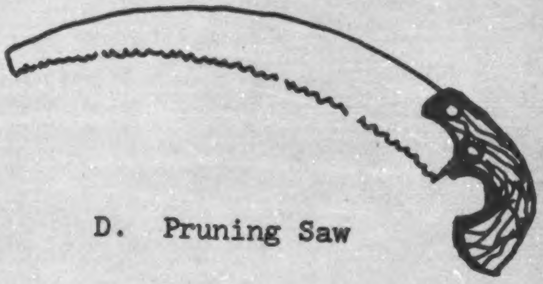
A. Hand Shears



B. Loppers



C. Hedge Shears



D. Pruning Saw

3. Inspect your tools to see if they are ready to use.

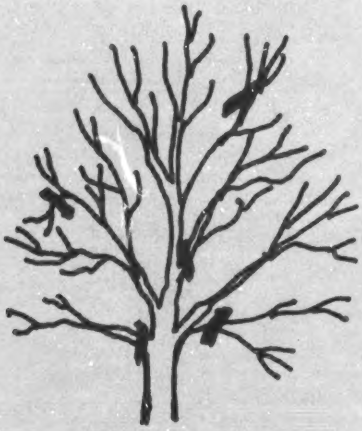
NOW: 1. Check over your tools again.

NEXT: Go on to Activity Card PT 3.

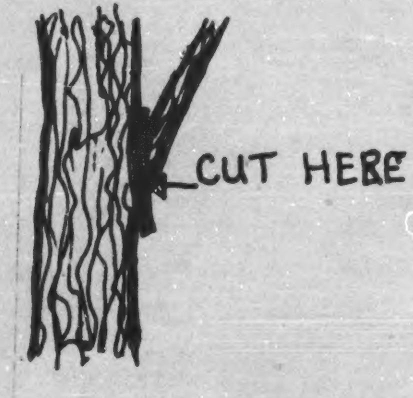
Pruning Newly Planted Trees

GET: pencil
pruning tools
gloves

DO: 1. Remember that newly planted trees need to have about 1/3 of the leaf area removed. Circle the areas which need pruning on this sample tree. All areas above the black lines should be circled.



2. Look at your newly planted tree. Decide which branches you will remove. As you remove these branches, be sure to cut them close to the bark. Be sure not to injure the bark.



NOW: 1. Have your teacher check your work.

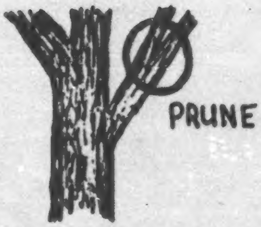
2. Clean up the area and return your tools.

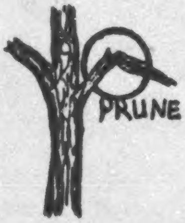
NEXT: Go to Activity Card PT 4.

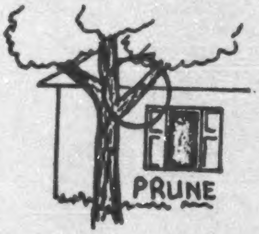
Removing Branches

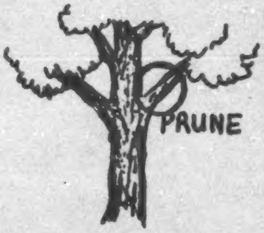
GET: pruning tools
gloves
yardstick

DO: 1. Look at your tree. Decide which branches need pruning. Look for V-shaped branches, damaged branches, branches which are in the way of a building and limbs which need pruning for alternate branching.

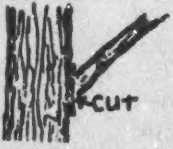




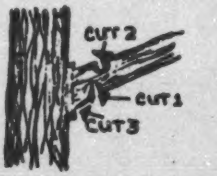




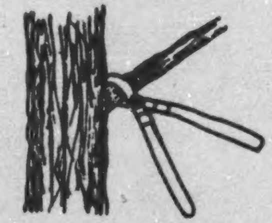
2. Measure the diameter of the branches which need pruning. Remove large branches close to the trunk. Do not leave a stub.

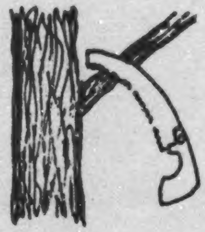


3. If the diameter of the branch is over 1 inch, you will need to double cut. Do not cut the bark of the trunk.



4. Those branches which are less than 1 inch in diameter can be removed with pruning shears or a pruning saw. Do not cut the bark of the trunk.





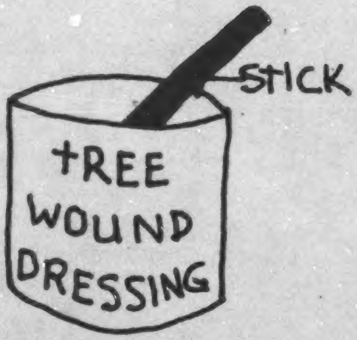
NOW: 1. When you are finished, clean up the area and return your tools.

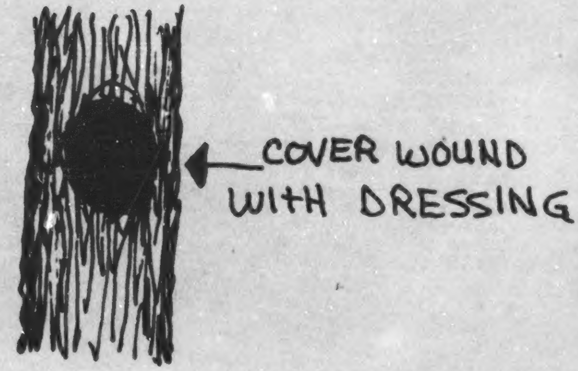
NEXT: Go to Activity Card PT 5.

Sealing all Large Cuts and Wounds

GET: tree wound dressing
a stick
gloves

DO:
1. All wounds over 1 inch in diameter (the size of a quarter) should be treated with tree wound dressing.
2. You use tree wound dressing to waterproof the wound, to help prevent decay and promote healing.
3. Take a stick and put it in the can of dressing. Remove some dressing with the stick.
4. Put the dressing on all the wounds which need to be covered.

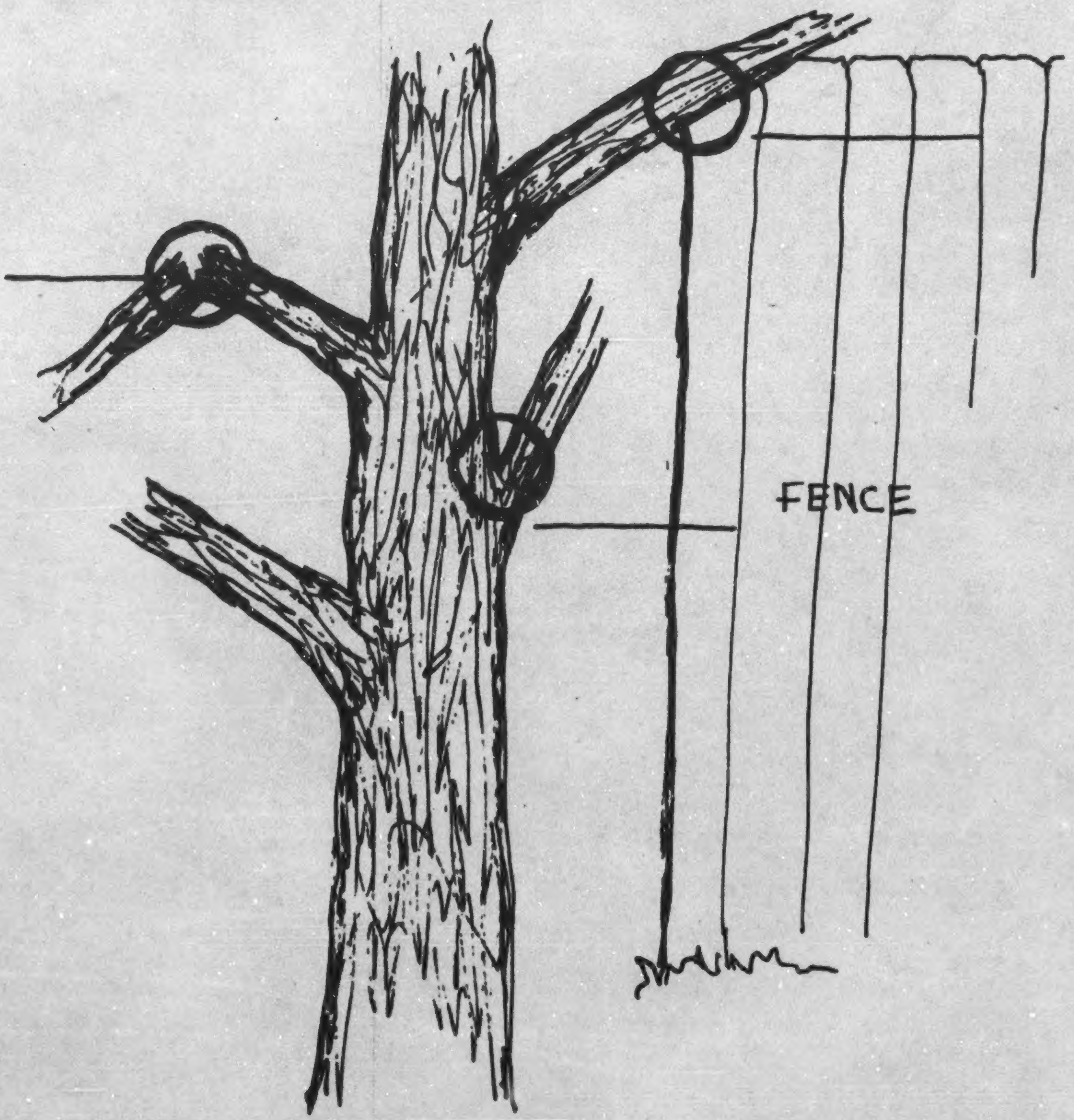




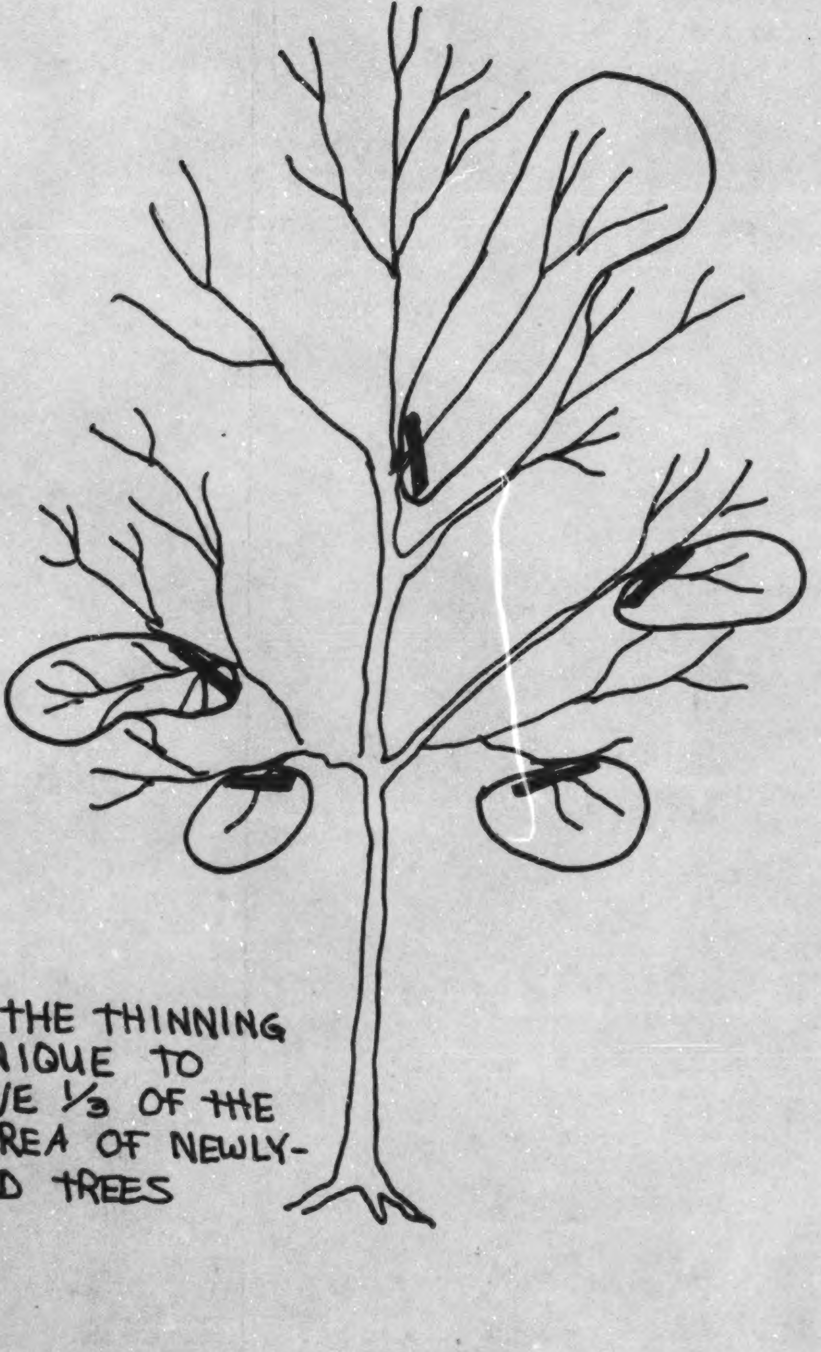
NOW:
1. Make sure all of the wounds have been covered.
2. Put the lid back on the can of dressing and return your tools.

NEXT: See your teacher.

Overhead Master 1

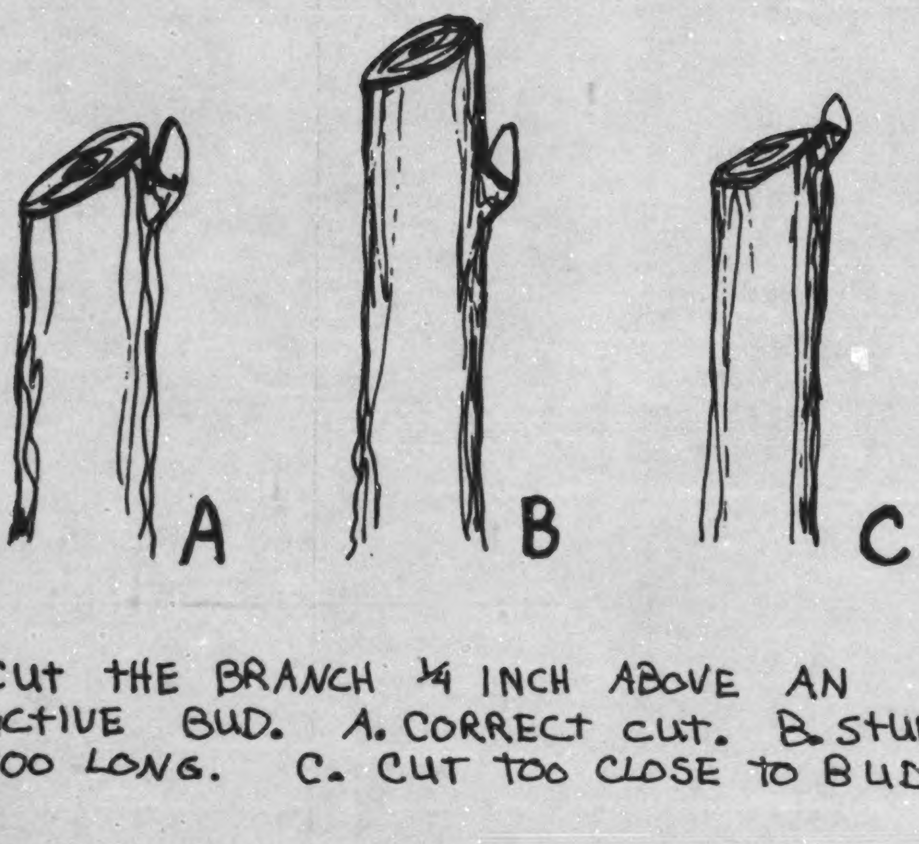


Overhead Master 2



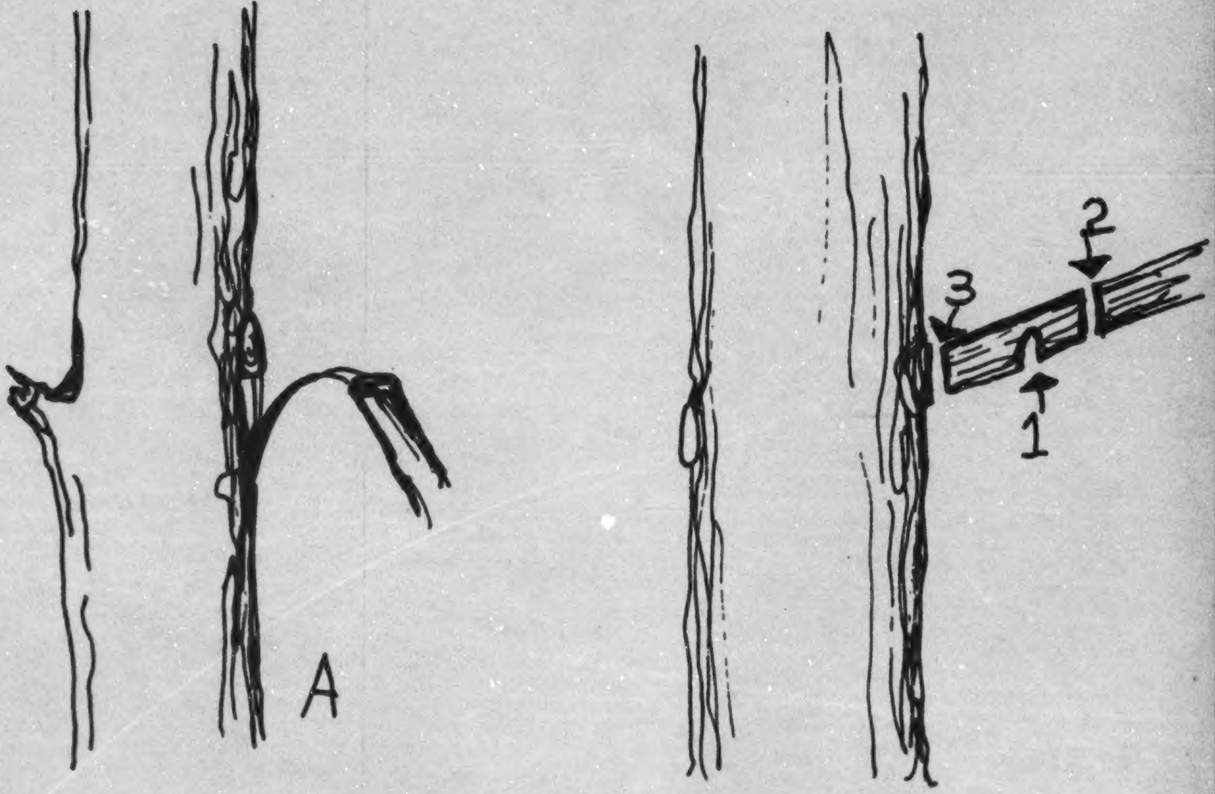
USE THE THINNING TECHNIQUE TO REMOVE 1/3 OF THE LEAF AREA OF NEWLY-PLANTED TREES

Overhead Master 3



CUT THE BRANCH ¼ INCH ABOVE AN ACTIVE BUD. A. CORRECT CUT. B. STUB TOO LONG. C. CUT TOO CLOSE TO BUD.

Overhead Master 4



REMOVE LARGE LIMBS WITH DOUBLE CUT METHOD. A. INCORRECT METHOD. B. CORRECT METHOD, 1-FIRST CUT, 2-SECOND CUT, 3-THIRD CUT.

JOB TITLE:	Gardening Groundskeeping
DUTY:	Maintaining Plants
TASK:	Reseeding Established Lawns
ACTIVITIES:	1. Collecting the Materials 2. Preparing the Area 3. Reseeding Small Areas 4. Reseeding Large Areas 5. Watering the Seed

Reseeding Established Lawns

This module will direct the student through the various steps of reseeding an established lawn. While its instructions are precise, there is a certain amount of prerequisite knowledge which is needed for successful mastery of this module. A list of prerequisite knowledge follows.

1. Knowledge of proper seed types for area.
2. Use of mechanical seed spreader.
3. Use of tools including rake and water sprinkler.

VOCABULARY

The teacher should go over the following words with the students:

SPREAD
LOOSEN
FIRM
DIRECTION
DISCUSS
BOUNDARY
EDGE
RESEED
GATHER
MATERIAL
OVERLAP
SOW
EQUAL
MECHANICAL SEED SPREADER
OPPOSITE
SPRINKLER
MOIST
DISPOSE
GAUGE

A CURRICULUM GUIDE FOR

Reseeding Established Lawns

Unit Of Instruction	Student Objectives	Suggested Learning Activities
Collecting the Materials		
	Given a lawn for reseeding, grass seed, lawn rake, water sprinkler and hose, work gloves and sticks, the student will be able:	
	1. to collect materials and tools needed for reseeding.	1. Take a field trip to a turf farm.
	2. to outline the areas to be reseeded.	2. Discuss with students the purposes of reseeding.
		3. Have students discuss reasons for reseeding.
		4. Use Activity Card R 1.
		5. Use Overhead Master 1.
		6. Help students find needed materials.
		7. Discuss reasons for types, blends and mixtures of seeds.
		8. Have students locate areas needing reseeding.
Preparing the Area		
	Given a lawn for reseeding, grass seed, lawn rake, water sprinkler and hose, work gloves and sticks, the student will be able:	
	1. to properly prepare the area for reseeding.	1. Demonstrate raking.
	2. to understand proper pressure for raking.	2. Help students to rake so that they understand proper raking pressure.
	3. to understand the reasons for raking in overlaping strips.	3. Have students illustrate raking in overlaping strips.
		4. Discuss with students the reasons for raking in strips.
		5. Use Activity Card R 2.
		6. Use Overhead Master 2.

Evaluation	Tools, Equipment and Supplies
1. teacher observation 2. answers to questions on Overhead Master 1	1. grass seed 2. lawn rake 3. water sprinkler and hose 4. work gloves 5. sticks
1. teacher observation	1. grass seed 2. lawn rake 3. water sprinkler and hose 4. work gloves 5. sticks

Unit of Instruction	Student Objectives	Suggested Learning Activities
Reseeding Small Areas	Given a lawn for reseeding, grass seed, lawn rake, water sprinkler and hose, work gloves and sticks, the student will be able:	
	1. to successfully and evenly hand sow grass over a small area.	1. Demonstrate sowing grass seed.
	2. to rake the area to insure mixture of soil and seed.	2. Have students practice sowing grass seed with sawdust or another applicable substance.
	3. to tamp the area lightly.	3. Discuss reasons for mixing soil and seed.
		4. Have students practice tamping soil with foot.
		5. Use Activity Card R 3.
Reseeding Entire Lawns	Given a lawn for reseeding, grass seed, lawn rake, water sprinkler and hose, work gloves and sticks, and a mechanical spreader, the student will be able:	
	1. to successfully reseed an established lawn by using a mechanical spreader.	1. Use Overhead Master 3
		2. Explain and demonstrate use of the mechanical spreader.
	2. to overlap seeding strips.	3. Use Activity Card R 4.
	3. to seed in two directions.	4. Have students practice using the mechanical spreader without seed in it.
		5. Discuss with students the purpose and importance of seeding in two directions.
		6. Have students practice overlapping strips. Use chalk to check their progress.

Evaluation	Tools, Equipment and Supplies
1. teacher observation	1. grass seed 2. lawn rake 3. water sprinkler and hose 4. work gloves 5. sticks
1. teacher observation	1. grass seed 2. lawn rake 3. water sprinkler and hose 4. work gloves 5. sticks 6. mechanical seed spreader

Unit of Instruction	Student Objectives	Suggested Learning Activities
Watering the Seed	Given a lawn for reseeding, grass seed, lawn rake, water sprinkler and hose, work gloves and sticks, the student will be able:	
	1. to water newly sown seed.	1. Use Activity Card R 5.
	2. to check to see if the seed needs rewatering.	2. Discuss the importance of proper watering.
	3. to clean up the area and return his tools.	3. Have students make charts of watering schedules for seeded areas.
		4. Inform students about signs for grass which needs watering.
		5. Discuss germination and grass growth.
		6. Demonstrate proper dampness during watering.

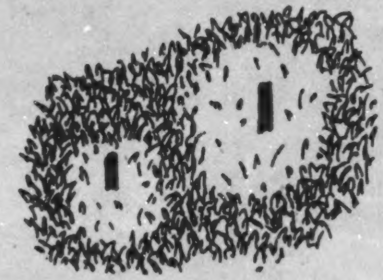
Evaluation	Tools, Equipment and Supplies
1. teacher observation	1. grass seed
	2. lawn rake
	3. water sprinkler and hose
	4. work gloves
	5. sticks
	6. mechanical seed spreader

Collecting the Materials

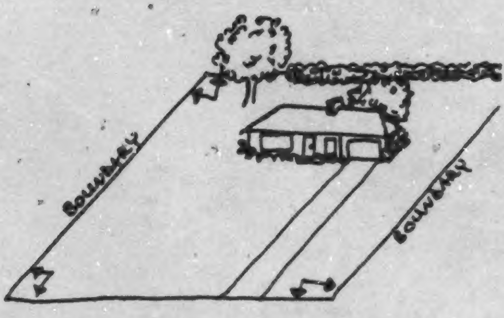
GET: grass seed
lawn rake
water sprinkler and hose
work gloves
sticks

DO: 1. Gather all of the materials needed for reseeding the lawn.

2. Discuss with your teacher what areas should be reseeded. If they are small areas, mark them with a stick.



3. If you are to reseed the entire lawn, have your teacher show you the boundaries, or edges, of the lawn



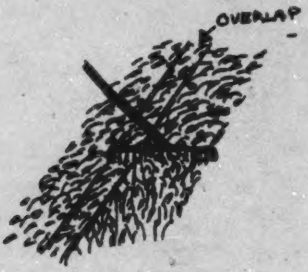
NOW: 1. Check to see that you have all of the materials that you will need.

NEXT: Go to Activity Card R 2.

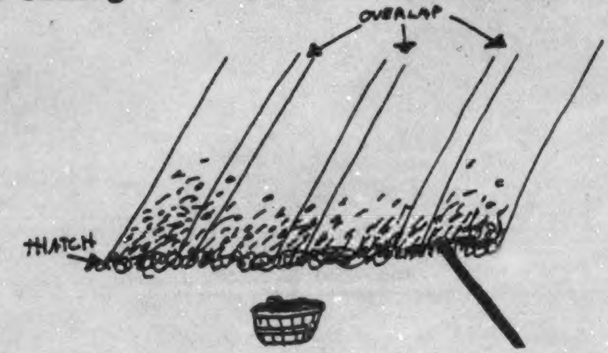
Preparing the Area

GET: Be sure that you have all of the materials from Activity Card R 1.

DO:
1. Put on your work gloves and get the rake.
2. Before you reseed the lawn, you will have to rake the lawn. Rake hard enough to rake up the old grass and clippings. Don't rake so hard that you pull up the grass.
3. If you are reseeding the entire lawn, go to step 5.
4. To rake the small areas, rake only the part you will reseed.
5. If you are raking the entire lawn, you should rake it in strips. Be sure that the strips overlap.



6. Continue raking until you are finished with the area.



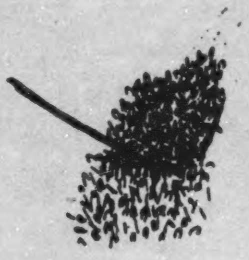
NOW: 1. Dispose of the raked up material. Ask your teacher about where to put it.

NEXT: If you are reseeding a small area, go to Activity Card R 3. If you are reseeding the whole lawn, go to Activity Card R 4.

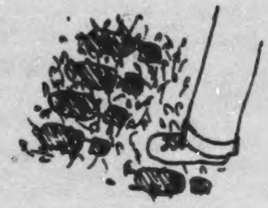
Reseeding Small Areas

GET: materials from Activity Card R 1

DO: 1. Now that you have removed all of the old and dead grass, rake the soil enough to loosen it.



2. Use your hand to sow the grass seed evenly over the area.
3. Rake the area lightly to mix the seed with the soil.
4. Use your foot to firm the soil. Press very lightly.



NOW: 1. Have your teacher check your work.

NEXT: Go to Activity Card R 5.

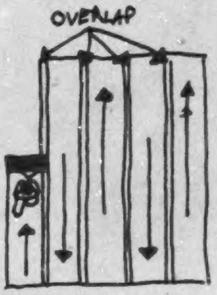
Reseeding the Entire Lawn

GET: materials from Activity Card R 1
mechanical seed spreader

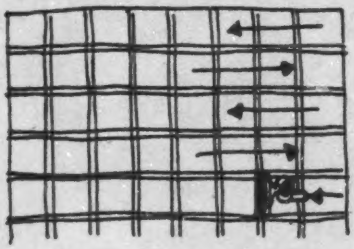
DO:

1. Divide the seed into two equal parts. Have your teacher set the rate gauge on the mechanical spreader.

2. Put 1/2 of the seed into the mechanical seed spreader. When you seed the lawn, be sure to do so in overlapping strips. Seed the lawn once in up and down strips.



3. Now put the rest of the seed into the spreader. Seed the lawn in the opposite direction. Make sure that your strips overlap.



NOW: 1. Have your teacher check your work.

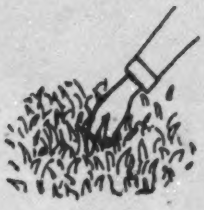
NEXT: Go to Activity Card R 5.

Watering the Seed

GET: materials from Activity Card R 1

DO:

1. Connect the hose and sprinkler.
2. In order for the new grass seed to grow, it must be kept moist.
3. Begin to water the lawn. Make sure that the soil is wet, but don't let the water form puddles on it.
4. After the first watering, you will have to check the area every day to see if it needs to be watered. To see if it needs watering, check the soil with your hand.



5. After the seed begins to grow, water it by following your teacher's directions.

NOW:

1. Put away all of your tools.
2. Clean up the area.

NEXT: See your teacher.

Appendix 5

JOB TITLES: Gardening
Groundskeeping

DUTY: Maintaining Plants

TASK: Transplanting Trees

ACTIVITIES:

1. Determining a size of hole
2. Laying out the planting site
3. Digging the hole
4. Preparing bare root trees
5. Preparing trees in containers
6. Planting bare root trees
7. Planting container and balled trees
8. Building the dam

PREREQUISITE SKILLS AND KNOWLEDGE

This module directs the student to perform numerous tasks. It is assumed that the student has certain basic knowledge and skills which are essential for the successful completion of these Activity Cards. The prerequisite knowledge and skills are as follows:

1. measurement and use of yardstick
2. addition of simple numbers
3. identification of trees
4. selection of tree variety to suit planting site
5. identification and use of common digging tools
6. identification of tap roots and rest of the root system
7. recognition of damaged roots
8. proper handling of tree during movement from place to place
9. use of metal shears (tin snips)
10. knowledge of soil types and tree suitability

VOCABULARY

The teacher should review these words with the students:

TAMP

TRANSPLANT

BARE ROOT

CONTAINER TREE

SPADE

MOUND

WIDTH

DEPTH

DAM

TAP ROOT

TWINE

A CURRICULUM GUIDE FOR

Transplanting Trees

Unit Of Instruction	Student Objectives	Suggested Learning Activities
Determining Size of Hole	Given a yardstick, a tree for planting, a paper and pencil, the student will be able: 1. to measure the width and depth of a tree root system. 2. to compute the width and depth of a hole required for planting a tree. (within teacher-specified limitations)	1. Review measuring. 2. Take a sample measurement of root systems on sample trees or drawing board overhead. (Both width and depth) 3. Perform computations for hole sizes for these samples. 4. Have students make drawings of three types of prepared root systems for their notes, indicating where measurements are taken. 5. Take field trip to local nursery to look at various types of trees and root systems. 6. Dig up wild stock trees for transplanting. Use ball and burlap or bare root. Measure root systems and determine hole sizes. 7. Discuss advantages and disadvantages of the three types of prepared root systems. 8. Use Activity Card T 1. 9. Use Overhead Master 1. 10. Use Department of Agriculture "Arbor Day" Program.
Laying Out the Planting Site	Given digging tools, a yardstick, tree for planting, and its location, the student will be able: 1. to transfer width measurements from his paper to the ground. 2. to use a spade to mark a circle on the ground for the hole.	1. Discuss and demonstrate how to measure and mark the hole. 2. Use Activity Card T 2. 3. Have students perform tasks for their own trees.

Evaluation	Tools, Equipment and Supplies
1. teacher observation 2. oral responses to teacher questions 3. accurate computations	1. yardstick 2. student handbook 3. scratch paper 4. pencil 5. tree for planting
1. measure diameters of circles marked by students	1. yardstick 2. measurements from Activity Card T 1. 3. digging tools (ex. shovel, spade, pick, etc) 4. Burlap bags, cardboard or plastic to receive soil from the hole (optional)

Unit of Instruction	Student Objectives	Suggested Learning Activities
Digging the Hole	Given a yardstick, digging tools, and the planting site marked in the previous activity, the student will be able: 1. to dig a hole to the measurement specifications determined in Activity Card T 1 and in the shape specified in Activity Cards T 2 and T 3.	1. Discuss, demonstrate or have one student demonstrate digging a hole to specifications. 2. Use Activity Card T 3. 3. Have each student dig the hole for the tree to be planted. 4. Use Overhead Master 2.
Preparing Bare Root Trees	Given bare root tree, the student will be able: 1. to recognize the tap root. 2. to distinguish and remove damaged roots. 3. to prepare the tree for planting by soaking and protecting the roots.	1. Discuss the function of the tap root and the necessity of leaving it intact. 2. Have students identify tap roots on specimen trees. 3. Discuss the importance and the procedure for removing damaged roots. 4. Use Activity Card T 4. 5. Discuss determining which roots have been damaged. 6. Demonstrate preparing bare root tree. 7. Have students prepare their bare root trees.

Evaluation	Tools, Equipment and Supplies
1. teacher observation 2. measure diameter and depth of hole 3. check sides of hole for smoothness and straightness	1. yardstick 2. measurements from Activity Card T 1 3. digging tools 4. burlap bags, cardboard, or plastic to receive soil from the hole (optional)
1. trees are adequately prepared for planting and soaked overnight	1. bucket 2. hose and running water 3. pruning shears

Unit of Instruction	Student Objectives	Suggested Learning Activities
Preparing Container Trees	Given a tree in a plastic or metal container and tin snips, the student will be able: 1. to handle a tree correctly. 2. to cut off and remove a container. 3. to separate matted tree roots.	1. Discuss the differences between paper mache, plastic, and metal containers. 2. Have students examine specimen containers. 3. Use Activity Card T 5. 4. Dig up a plant which was planted in a paper mache container to show how roots begin to penetrate it. 5. Demonstrate proper use of tin snips and have students practice on used containers. 6. Discuss and demonstrate the necessity of loosening matted roots.
Planting Bare Root Trees	Given a properly prepared bare root tree for planting, a properly dug hole, and digging tools, the student will be able: 1. to determine correct planting depth. 2. to use correct techniques to plant a bare root tree.	1. Discuss, using chalkboard or Overhead Master 3, how a bare root tree should be planted. 2. Use Activity Card T 6. 3. Demonstrate planting one tree, or have one student plant his tree while the teacher talks him through the process. 4. Have each student plant a tree.

Evaluation	Tools, Equipment and Supplies
1. teacher observation	1. tin snips 2. work gloves
1. check to see that trees are planted to proper depth and soil is adequately firmed 2. hole should be level with original soil line 3. roots are straightened out for planting	1. digging tools 2. bare root tree prepared for planting

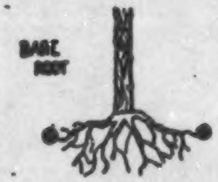
Unit of Instruction	Student Objectives	Suggested Learning Activities
Planting Container and Balled Trees	Given a balled root tree or container tree, wire cutters, digging tools, and a properly dug hole, the student will be able: 1. to cut the twine at the top of the burlap ball (if applicable). 2. to place tree to correct planting depth. 3. to handle the tree by the ball of soil rather than the trunk. 4. to properly plant the tree.	1. Discuss or demonstrate what can happen to a tree if handled by the trunk. 2. Discuss what can result if tree is planted too deeply. Use Overhead Master 5. 3. Have students speculate about the reasons for cutting the twine at the top of the balled root tree. 4. Use Activity Card T 7. 5. Demonstrate or have a student demonstrate while teacher directs the planting of a tree. 6. Discuss reasons for firming soil. 7. Demonstrate degree of soil firmness needed.
Building the Dam	Given a properly planted tree, a hose with running water, digging tools, and a rake, the student will be able: 1. to discuss the purpose for building a dam around the planted tree. 2. to build an adequate dam around the planted tree. 3. to clean up the planting site.	1. Discuss the construction of a dam around the newly planted tree. Use Overhead Master 6. 2. Use Activity Card T 8. 3. Demonstrate or have a student demonstrate the construction of a dam around one tree. 4. Have students build dams around their own trees. 5. Have students clean up planting sites. 6. Have students water their newly planted trees.

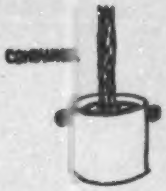
Evaluation	Tools, Equipment and Supplies
1. check to see that trees are planted to proper depth and soil is adequately firmed 2. hole should be level with original soil line	1. digging tools 2. wire cutter (for balled tree only)
1. teacher observation	1. digging tools 2. hose and water 3. rake

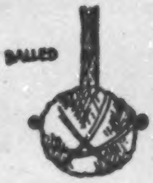
Transplanting Trees
Determining Size of Hole

GET: yardstick
paper
pencil
tree to plant

DO: 1. Measure the width of the root system, container or ball. The dots show you where to begin and end the measuring.



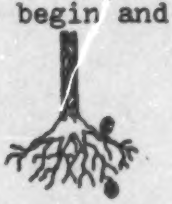


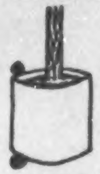


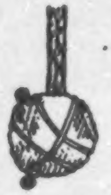
2. Write down your measurement. Add 12 inches to it. The total is the width of the hole.

ex. = width of root system
+12"
= width of tree hole

3. Measure the depth of the root system. The dots show you where to begin and end your measuring.







4. Write down your measurement. Add 6" to it.

ex. = depth of root system
+6"
= depth of hole

NOW: 1. Recheck your measurements

NEXT: Go to Activity Card T 2.

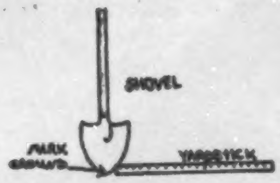
Transplanting Trees
Laying Out the Planting Site

GET: your depth measurements
from Activity Card T 1
a yardstick
digging tools
a burlap bag or a
large piece of
cardboard

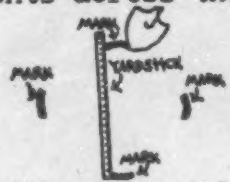
DO:

1. Locate the place where the tree is to be planted. Be sure to check with your teacher.

2. Using the measurements in Activity Card T 1, mark the beginning and ending measurements on the ground with your shovel.



3. Then, with your shovel, mark the same beginning and ending measurements across the middle.



4. Trace a circle with your spade connecting the 4 marks.

5. Spread out your burlap or cardboard next to the spot where you will dig the hole. As you dig the hole, you will put the soil on the burlap or cardboard.

NOW: 1. Make sure that the circle is the right size.

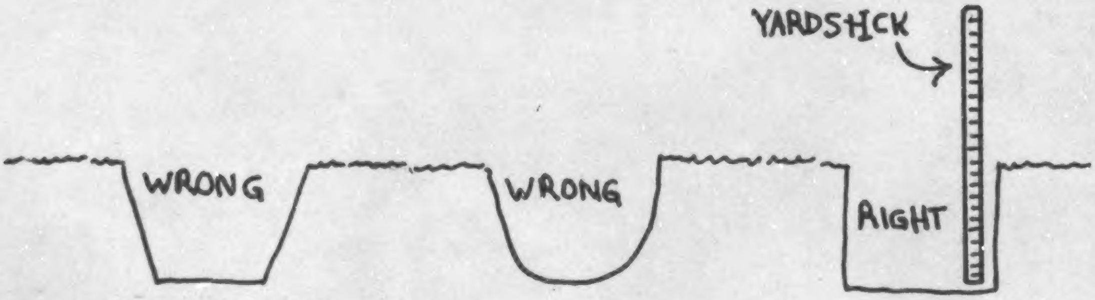
NEXT: Go to Activity Card T 3.

Transplanting Trees
Digging the Hole

GET: your depth measurements
from step 3, Activity
Card T1
digging tools
yardstick
burlap or cardboard from
Activity Card T 2

DO:

1. Begin digging your hole, use your spade to cut through the sod. Cut through the sod all the way around the circle. You will probably need to loosen the edges of the sod. Do this by twisting the spade handle when it is in the ground.
2. Remove the sod inside the circle with your spade. Place the sod on the burlap or cardboard.
3. When you have removed some of the soil, get your yardstick. Check the depth of the hole all the way around the circle. Continue digging until the hole is deep enough for your tree.
4. Be sure to keep the sides of the hole straight and smooth. Your yardstick should stand straight against the sides of the hole.



NOW: You have completed digging the hole.

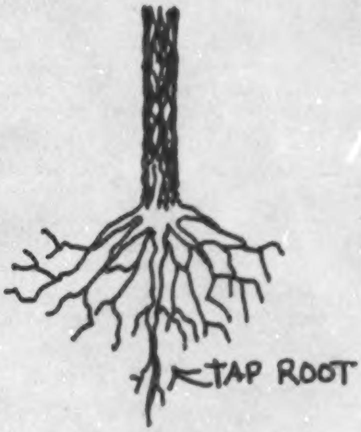
1. Ask yourself: (1) Is the hole the right depth? (2) Are the sides straight and smooth? (3) Is all the soil on the burlap or cardboard?
2. Have your teacher check your work.

NEXT: Go to Activity Card T 4 if your tree is a bare root tree.
or T 5 if your tree is in a container
or T 7 if your tree is a balled tree

Transplanting Trees
Preparing Bare Root Trees for Planting

GET: hose
pruning shears
bucket

DO: 1. Carefully cut off all damaged roots with pruning shears. Be careful not to cut the tap root.



2. Soak the tree in water over night. Do not soak it for more than 12 hours.

3. Do not let the roots dry out. Leave the tree in the water until you are ready to plant it.

NOW: 1. Have your teacher check your tree to make sure it is ready to plant.

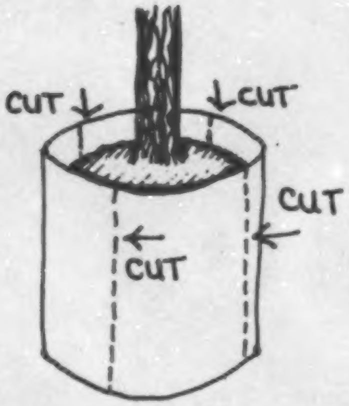
NEXT: Go to Activity Card T 6.

Transplanting Trees
Preparing Container Trees for Planting

GET: can cutters
work gloves

DO:

1. Find out what sort of container your tree is in. Get your can cutters.
2. Set your tree down beside the hole.
3. Put on your work gloves.
4. Cut the sides of the container in four places.



5. Pull off the container if it is metal or plastic. If the container is paper mache, leave it on.
6. If the roots are tangled, carefully pull them loose.
7. Be sure not to disturb the root ball.

NOW: 1. Make sure that your teacher checks the roots.

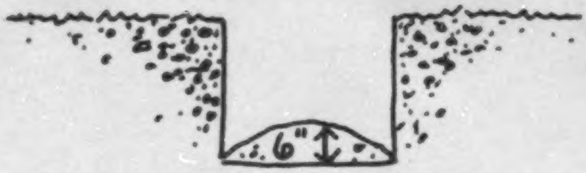
NEXT: Go to Activity Card T 8.

Transplanting Trees
Planting Bare Root Trees

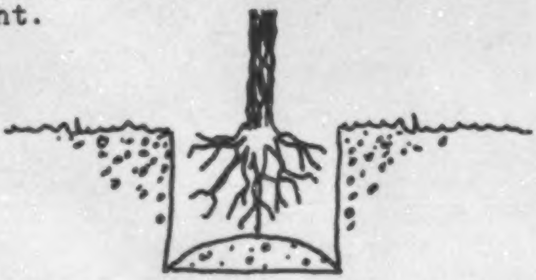
GET: digging tools
bare root tree for planting

DO:

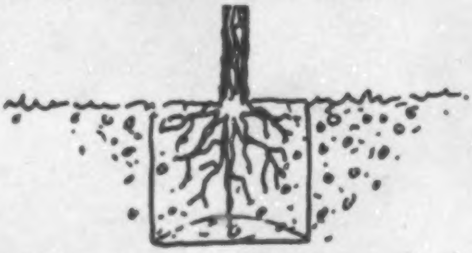
1. Pile about 6 inches of loose soil in a mound in the bottom of the hole.



2. Place the tree carefully in the hole. Be sure to keep the tree straight at all times.
3. Spread the roots around the mound. Keep all of the roots straight.



4. Fill the hole with soil until it is full.



5. Firm the soil gently with your foot.
6. Add additional soil if needed.

NOW:

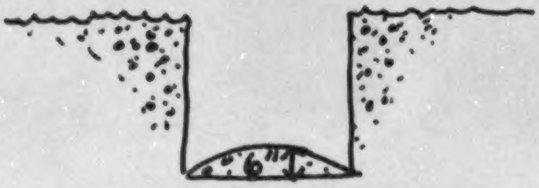
1. Be sure the tree is straight.
2. Have your teacher check your work.

NEXT: Go to Activity Card T 8.

Transplanting Trees
Planting Container and Balled Trees

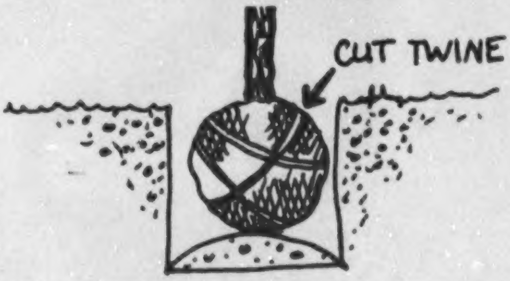
GET: digging tools
wire cutters

DO: 1. Pile about 6 inches of loose soil in a mound in the bottom of the hole.

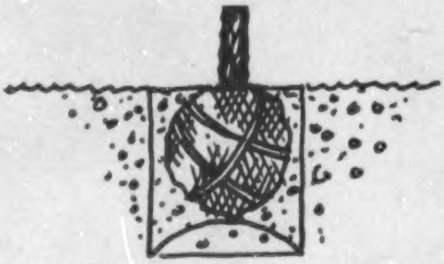


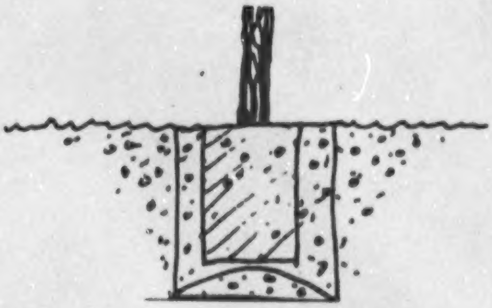
2. Place the tree carefully in the hole. Be sure to keep the tree straight at all times.

3. If planting a balled root, cut the twine at the top of the root ball. Loosen the burlap at the top.



4. Fill the hole with soil until it is full. Be sure to keep the tree straight.





5. Firm the soil gently with your foot.

6. Add additional soil if needed.

NOW: 1. Be sure the tree is straight.

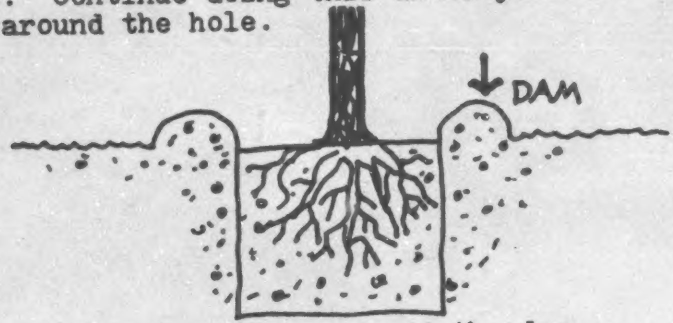
2. Add additional soil if needed.

NEXT: Go to Activity Card T 8.

Transplanting Trees
Building the Dam

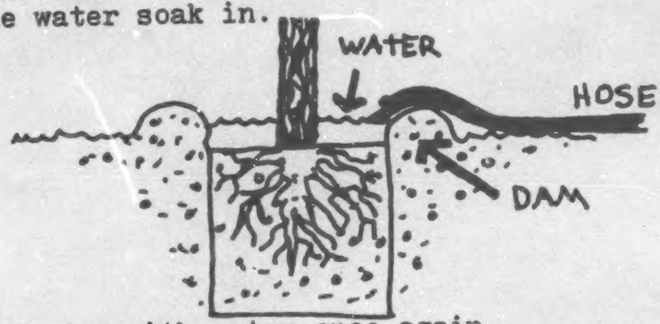
GET: digging tools
hose and water
rake

DO: 1. Take some soil and build a 2 to 3 inch high dam around the hole. Continue doing this until you have made a complete dam around the hole.



2. Use a rake to clean up around the dam.

3. Fill the dam with water. The dam will hold the water in. Let the water soak in.



4. Fill the dam with water once again.

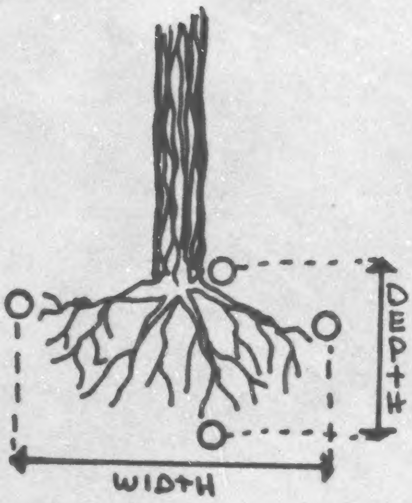
NOW: 1. Have your teacher check your work.

2. Pick up your tools.

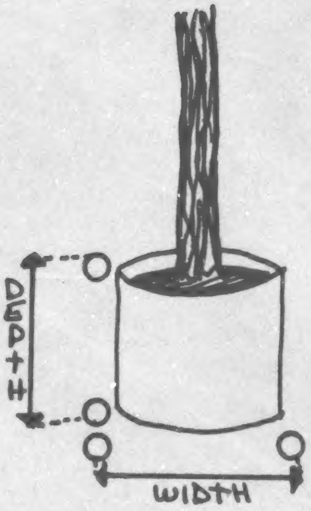
3. Clean up the area.

NEXT: See your teacher.

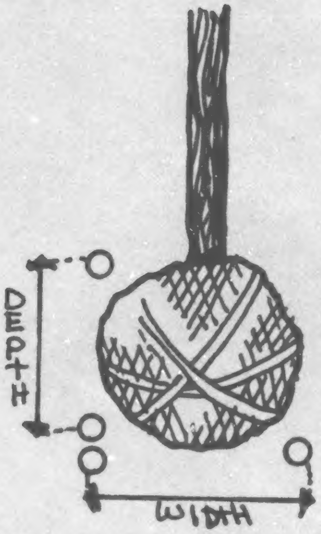
Overhead 1


DEPTH
WIDTH

BARE ROOT

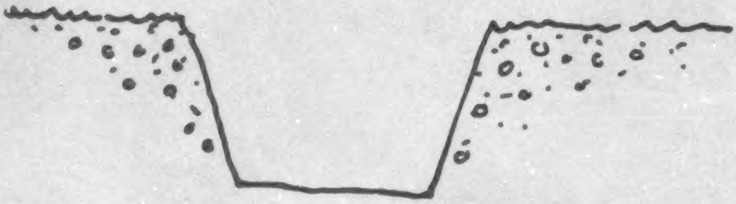

DEPTH
WIDTH

CONTAINER

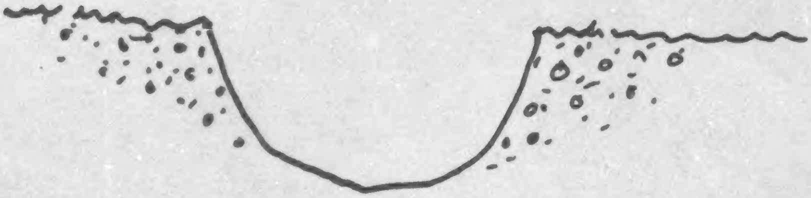

DEPTH
WIDTH

BALLED

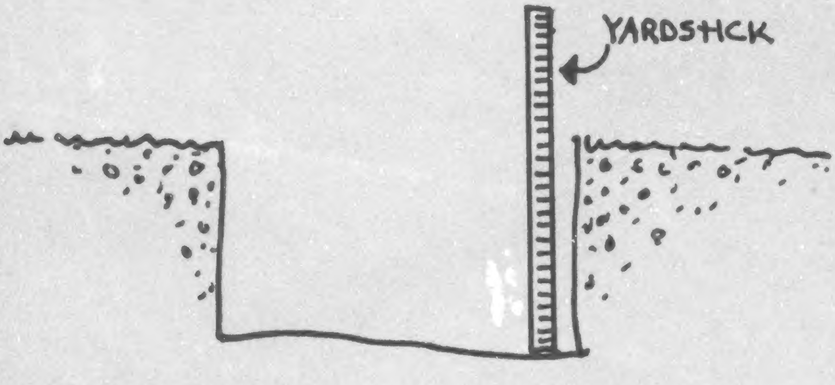
Overhead 2



WRONG



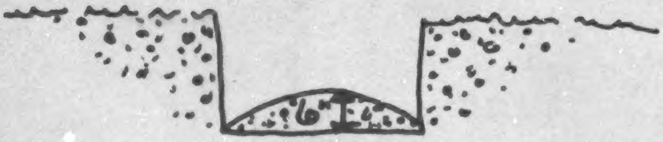
WRONG



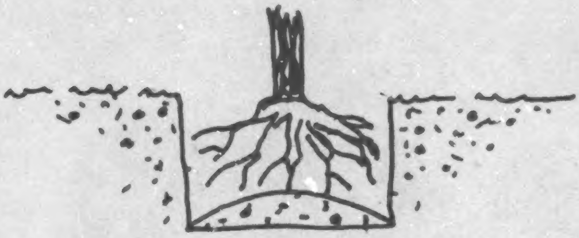
RIGHT

Overhead 3

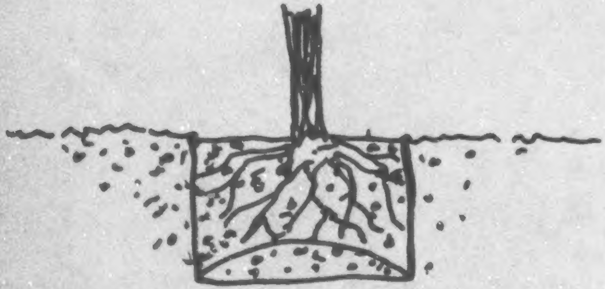
STEP 1
BUILD MOUND



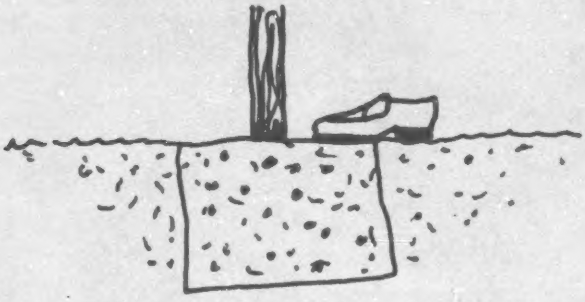
STEP 2
PLACE TREE TO PROPER DEPTH AND STRAIGHTEN ROOT SYSTEM



STEP 3
FILL IN HOLE

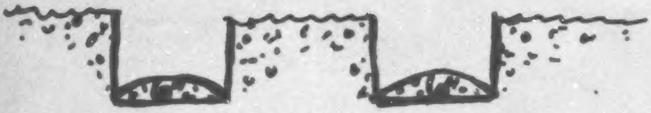


STEP 4
GENTLY FIRM SOIL WITH YOUR FOOT

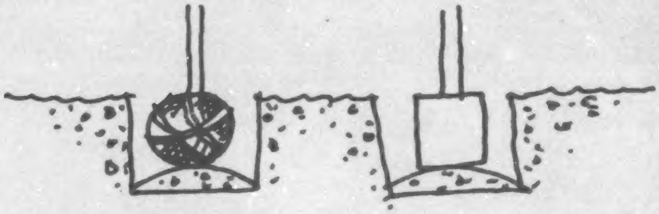


Overhead 4

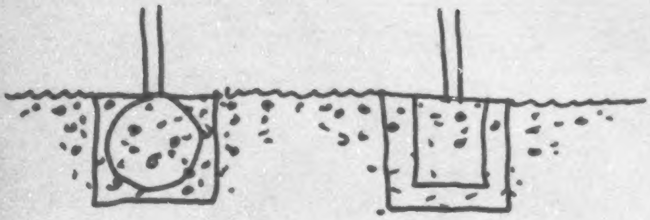
STEP 1
BUILD MOUND



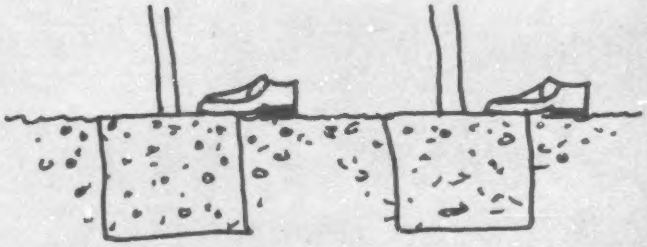
STEP 2
PLACE TREE TO PROPER
DEPTH (CUT TWINE AT TOP
OF BURLAP BALL)



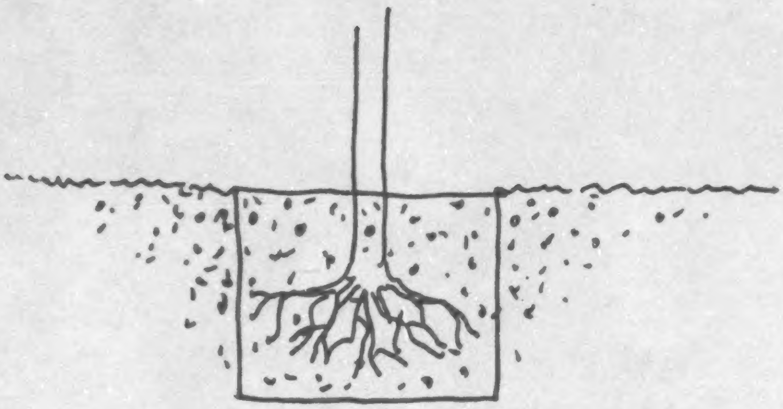
STEP 3
FILL IN HOLE



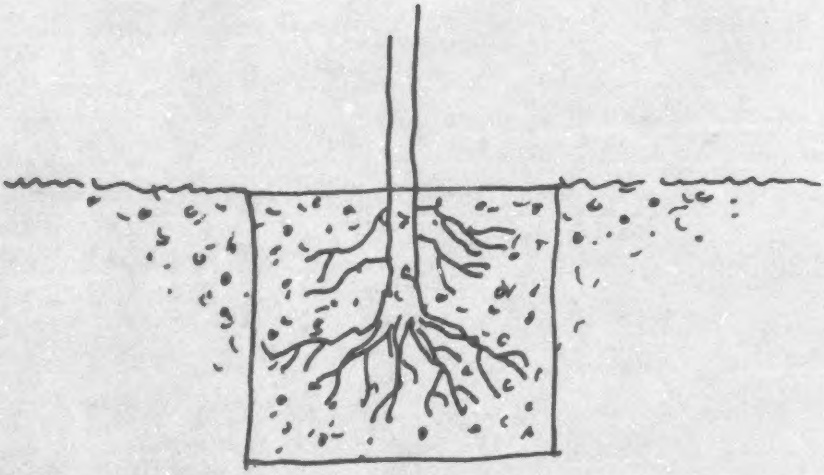
STEP 4
GENTLY FIRM SOIL
WITH YOUR FOOT



Overhead 5

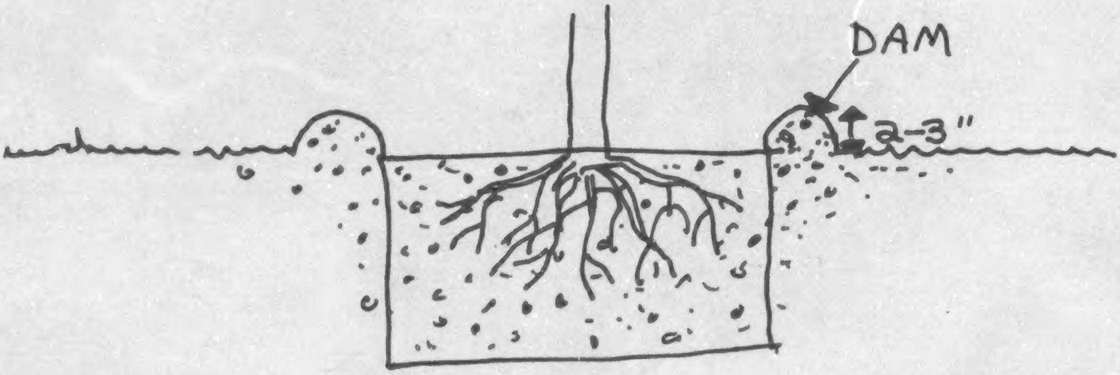


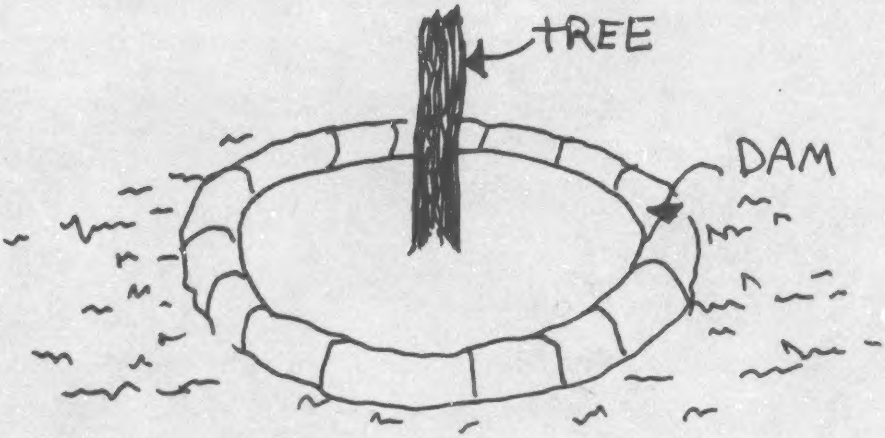
TREE IS PLANTED TOO DEEPLY



SECOND ROOT SYSTEM DEVELOPES

Overhead 6





JOB TITLES:	Gardening Groundskeeping
DUTY:	Preparing and Improving Soil
TASK:	Preparing a Compost Pile
ACTIVITIES:	1. Understanding Compost 2. Getting Ready to Make the Compost Pile 3. Layering the Pile 4. Watering the Compost Bin 5. Finishing the Compost Pile

PREREQUISITE SKILLS AND KNOWLEDGE

This module on making a compost pile will direct the student's performance of various tasks. It cannot, however, provide the student with all of the knowledge he needs to thoroughly comprehend compost piles. A list of prerequisite skills follows:

1. use of shovel, pitchfork, watering hose
2. use of yardstick
3. identification of compost materials
4. knowledge of decay process

VOCABULARY

The teacher should review these words with the student:

COMPOST

PARTIALLY

DECAY

LOCATE

LOAMY SOIL

BIN

FERTILIZER

LAYER

DISH

PITCHFORK

SHOVEL

DRAIN

A CURRICULUM GUIDE FOR

Building a Compost Pile

Unit Of Instruction	Student Objectives	Suggested Learning Activities
Understanding Compost	Given information on the nature and purpose of a compost pile, the student will be able: 1. to show understanding of the uses and location of a compost pile.	1. Discuss with the students the purposes of a compost pile. 2. Define and show examples of plant material for compost piles. 3. Have students collect plant material for use in the compost pile. 4. Use Activity Card C 1. 5. Use Overhead Master 1. 6. Take students out to the location of the compost bin. 7. Discuss with the students the advantages of using compost and the situations in which one should use compost material.
Getting Ready to Make the Compost Pile	Given work gloves, a compost for loamy soil, plant material, and fertilizer, the student will be able: 1. to understand why the materials are layered in the compost bin. 2. to arrange materials near the bin in preparation for making the compost pile.	1. Discuss the purpose and importance of each ingredient of the compost pile. 2. Instruct students on layering of materials. 3. Use Activity Card C 2. 4. Help students locate materials to be taken to bin site. 5. Discuss the decaying process in a compost bin. 6. Have students illustrate or build a mock up of a compost bin.

Evaluation	Tools, Equipment and Supplies
1. teacher observation	1. pencil
2. answers to Activity Card C 1	2. paper
1. teacher observation	1. work gloves
	2. loamy soil
	3. plant material
	4. fertilizer

Unit of Instruction	Student Objectives	Suggested Learning Activities
Layering the Pile	Given the materials collected in the previous unit, a shovel, work gloves, a yardstick, and a pencil, the student will be able: 1. to correctly measure a twelve inch layer of compost material. 2. to properly layer compost materials. 3. to layer materials until completion of pile.	1. Review use of the yardstick. 2. Demonstrate shoveling material into the bin. 3. Discuss purposes of layering materials. 4. Use Activity Card C 3. 5. Use Overhead Master 2. 6. Review safety measures for shoveling. 7. Demonstrate a "thin layer" of fertilizer.
Watering the Compost Bin	Given a properly layered compost bin, work gloves, and a hose with running water, the student will be able: 1. to properly water a compost bin. 2. to understand the need for water in the decaying process.	1. Demonstrate watering of a bin. 2. Discuss the purposes of watering the bin. 3. Explain the term "dish" and its importance. 4. Use Activity Card C 4.
Finishing the Compost Pile	Given a completed, watered compost pile, a large piece of plastic, a pitchfork, work gloves and a stapler, the student will be able: 1. to secure by stapling the plastic to the compost bin. 2. to punch drainage holes in the plastic. 3. to clean up the compost area.	1. Discuss the purposes of the plastic covering and the drainage holes. 2. Demonstrate the placement of drainage holes. 3. Use Activity Card C 5. 4. Discuss the importance of cleaning up the worksite.

Evaluation	Tools, Equipment and Supplies
1. teacher observation of layering 2. answers to questions on Overhead Master 2	1. shovel 2. work gloves 3. yardstick 4. pencil 5. materials gathered in the previous unit
1. teacher observation	1. work gloves 2. hose with running water
1. teacher observation	1. large piece of clear plastic 2. pitchfork 3. work gloves 4. stapler

Understanding Compost

GET: paper
pencil

DO:

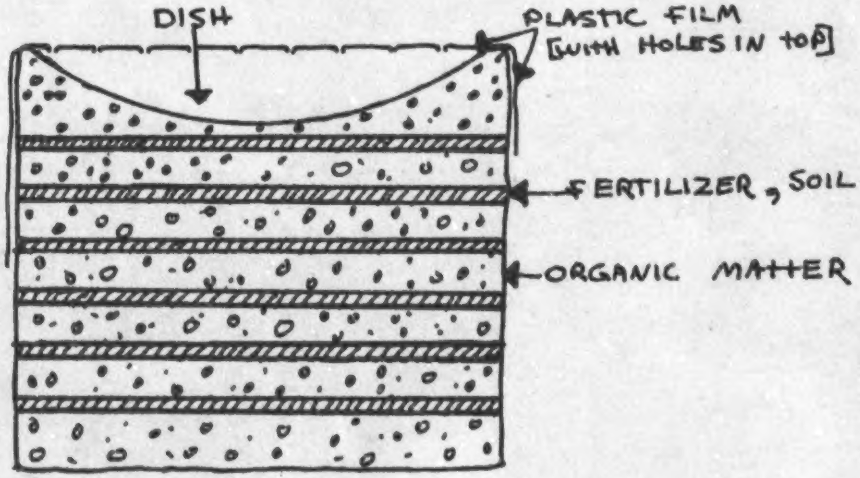
1. Compost is plant material that is partially decayed. It is used in many ways. It can be worked into the soil before and after planting. It can be spread lightly over grass to help it grow. It can also be used in greenhouses.

2. List on your paper two ways to use compost.

3. A compost pile should be located in the shade. As plant material decays, it gets hot. The shade will prevent it from getting too hot.

4. List on your paper why a compost pile should be located in the shade.

5. After you make a compost pile, it will take about three months for it to be ready to use. Why do you think it takes that long? Put your answer on your paper.



A Compost Pile

NOW: 1. Have your teacher check your answers.

NEXT: Go to Activity Card C 2.

Getting Ready to Make the Compost Pile

GET: work gloves
loamy soil
plant material
fertilizer

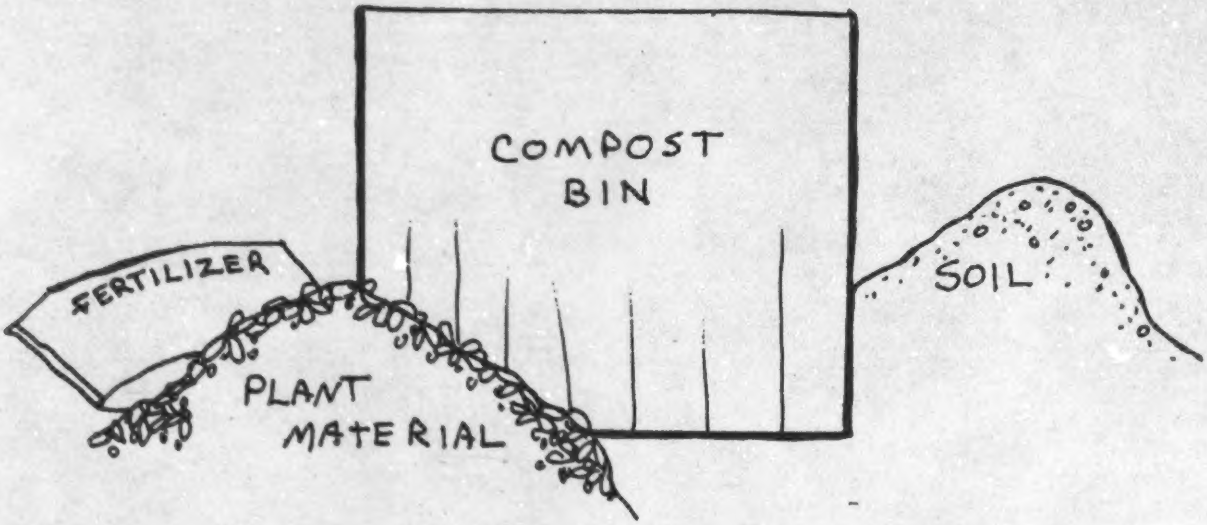
DO:

1. A compost pile has layers of different materials in it. This helps the plant material to decay.
2. Before you actually layer the material in the compost bin, you must get all of the materials together.
3. Put on your work gloves. Place these materials in piles next to the compost bin:

fertilizer bag

loamy soil

plant material



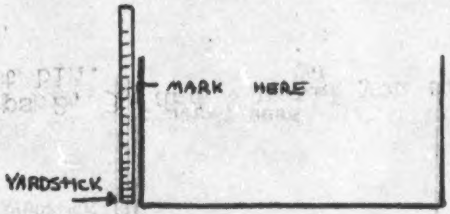
NOW: 1. Recheck the list to be sure that you have all of the materials.

NEXT: Go to Activity Card C 3.

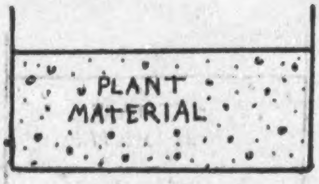
Layering the Pile

GET: shovel
work gloves
materials gathered in Activity Card C 3
yardstick
pencil

DO: 1. Get your yardstick and pencil. Measure 12 inches high and mark that spot on the bin.

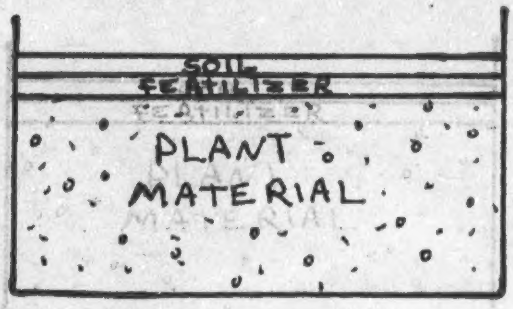

MARK HERE
YARDSTICK

2. Use your shovel to fill the bottom of the pile with plant material. Fill it to the 12 inch mark. Pack the soil firmly.


PLANT MATERIAL

3. Lightly scatter a thin layer of fertilizer over the plant material.

4. Scatter 12 shovels of loam soil over the fertilizer.


SOIL
FERTILIZER
PLANT MATERIAL

5. Repeat steps 2, 3, and 4 until you are close to the top of the compost bin.

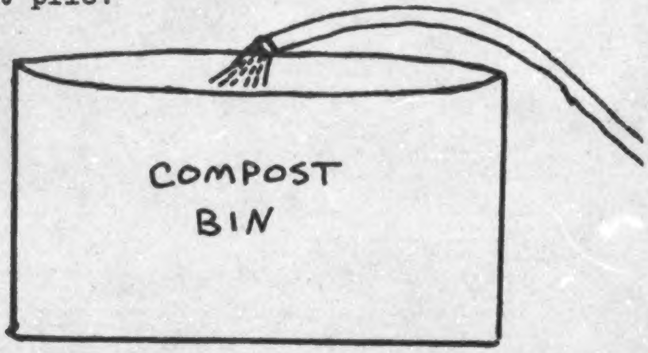
NOW: 1. Have your teacher check your work.

NEXT: Go to Activity Card C 4.

Watering the Compost Bin

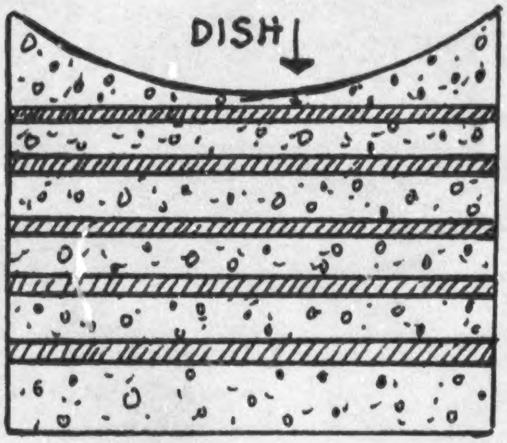
GET: work gloves
hose with running water

DO: 1. Place the hose in the center of the top layer of the compost pile.



2. Turn on the water. Let the water run until the entire pile is wet and a small amount of water is standing in the top of the pile. Turn off the hose.

3. Because the water started to flow in the center of the pile, the center will be lower than the sides. Leave it this way. This lower spot is called the "dish".



NOW: 1. Put the hose away.

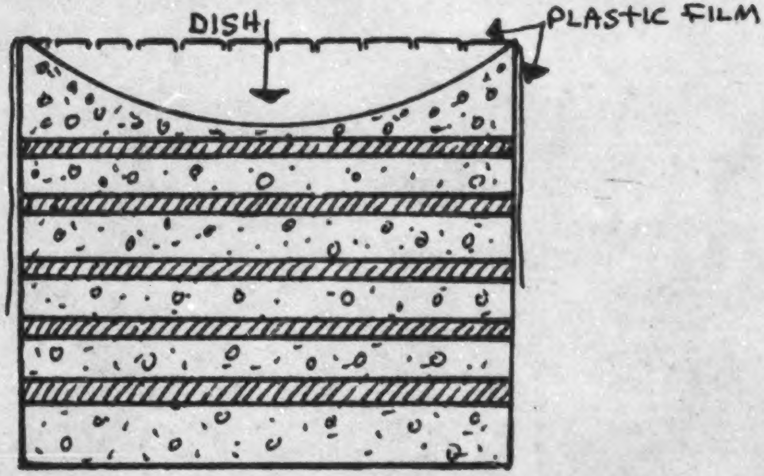
NEXT: Go to Activity Card C 5.

Finishing the Compost Pile

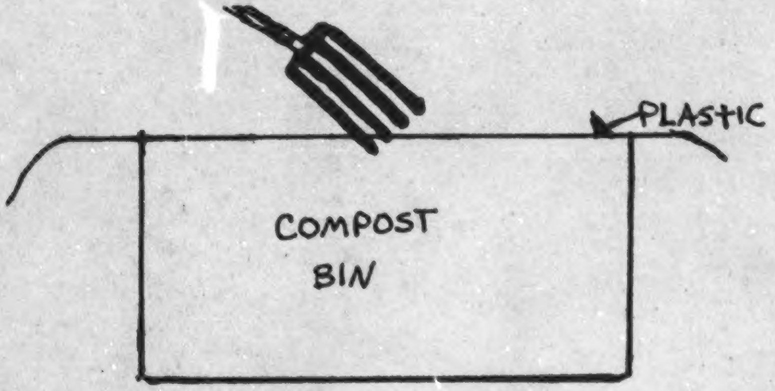
GET: large piece of clear plastic
pitchfork
work gloves
stapler

DO:

1. Place the plastic over the compost bin.
2. Staple the plastic around the edges of the bin. Be sure that the plastic is tight.



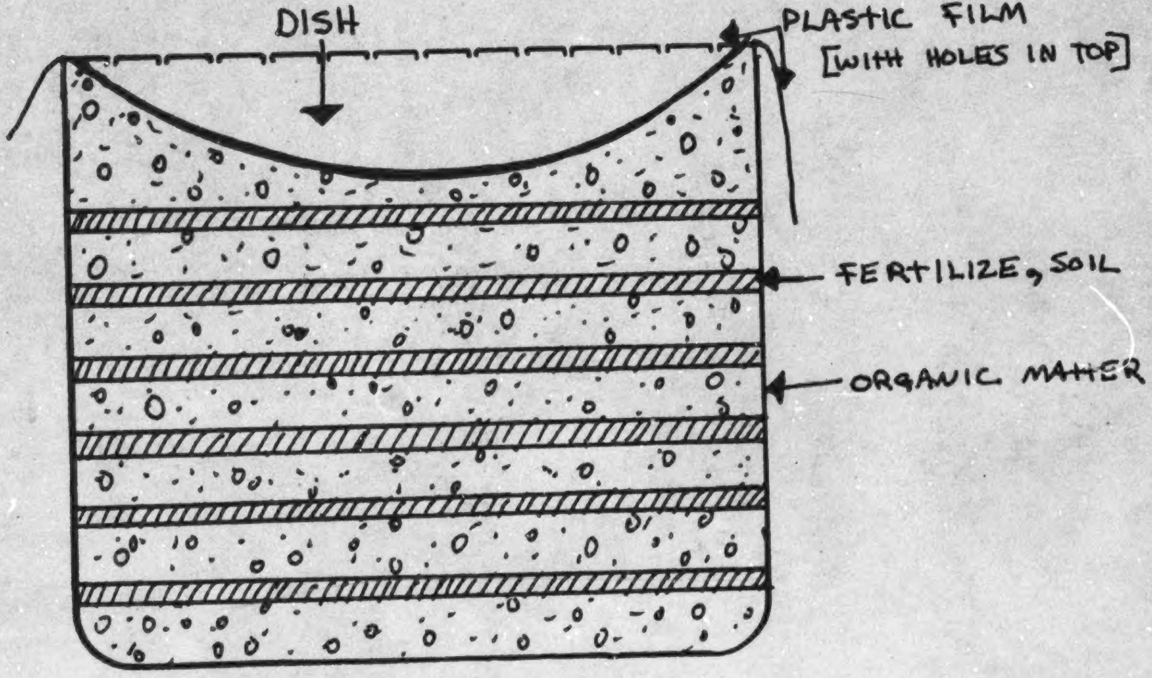
3. With the pitchfork, jab holes in the plastic about one foot apart. Do this over the dish area. This will allow rainwater to drain into the compost pile.



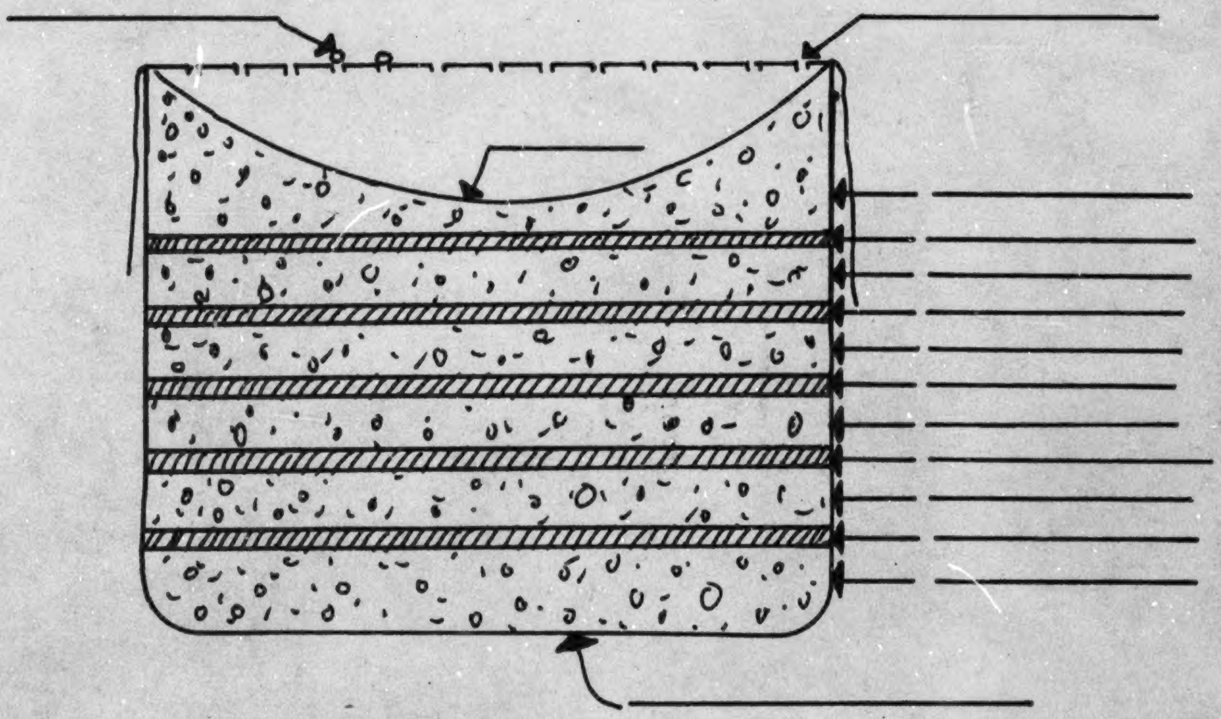
NOW:

1. Pick up all of your tools and clean up the area.
2. Return your tools to the proper place.
3. Have your teacher check your work.

NEXT: See your teacher.


DISH
PLASTIC FILM
[WITH HOLES IN TOP]
FERTILIZE, SOIL
ORGANIC MATTER

LABEL THE PARTS



Appendix 7

JOB TITLE: Gardening
Groundskeeping

DUTY: Maintaining Plants

TASK: Repairing Damaged Bark

ACTIVITIES:

1. Determining the Need for Repair
2. Collecting the Materials
3. Removing the Bark
4. Shaping the Wound
5. Dressing the Wound

Repairing Damaged Bark

This module will guide a student through the processes needed to repair damaged bark. While its directions are precise, it cannot teach the student all of the prerequisite knowledge that he needs to successfully complete the module. A list of prerequisite knowledge follows:

1. use of hammer, chisel and paint brush
2. discrimination of injured bark
3. knowledge of safety precautions

VOCABULARY

The teacher should review these words with the student:

BARK
REPAIR
MATERIAL
DRESSING
INJURE
DISEASE
MALLET
CHISEL
TREE PAINT
WIRE BRUSH
CONDITION
LOOSE
HEALTHY
WOUND
SHAPE
SEAL

A CURRICULUM GUIDE FOR

Repairing Damaged Bark

Unit Of Instruction	Student Objectives	Suggested Learning Activities
Determining the Need for Repair	Given paper, pencil, and Activity Card B 1, the student will be able: 1. to list three causes of damaged bark. 2. to identify damaged bark.	1. Discuss reasons for treating damaged bark. 2. Show students examples of healthy and damaged bark. 3. Have students find examples of damaged bark. 4. Have students compile lists of causes of damage. 5. Use Activity Card B 1. 6. Use Overhead Master 1. 7. Have students illustrate damage causes.
Collecting the Materials	Given paper, pencil and materials to collect, the student will be able: 1. to identify correctly tools needed for bark repair. 2. to inspect tools for working condition.	1. Have students identify materials needed for unit. 2. Display tools in poor and proper working condition. 3. Discuss safety procedures and be sure that students know them. 4. Use Activity Card B 2. 5. Have students illustrate tools for unit.

Evaluation	Tools, Equipment and Supplies
1. teacher observation 2. answers to questions on Activity Card B 1.	1. paper 2. pencil
1. teacher observation 2. answers to questions on Activity Card B 2.	1. hammer or mallet 2. wood chisel 3. tree paint 4. paint brush 5. work gloves 6. wire brush 7. bucket 8. paper and pencil

Unit of Instruction	Student Objectives	Suggested Learning Activities
Removing Loose Bark	Given a tree with damaged loose bark, work gloves and a bucket, the student will be able: 1. to remove loose bark by hand. 2. to place loose bark in the bucket. 3. to follow all safety precautions.	1. Use Overhead Master 2. 2. Discuss with students the function of bark. 3. Discuss the difference between tree bark and tree wood. 4. Use Activity Card B 3. 5. Demonstrate the removal of loose bark. 6. Review safety precautions with students.
Shaping the Wound	Given a tree with damaged bark, tools needed for shaping, and work gloves, the student will be able: 1. to properly shape the wound of a tree with damaged bark in preparation for sealing the wound. 2. to follow all safety precautions. 3. to understand the reason behind the proper shaping of the wound.	1. Use Overhead Master 3. 2. Use Activity Card B 4. 3. Demonstrate use of hammer and chisel. 4. Review safety precautions. 5. Discuss purpose of proper shaping of wound. 6. Have students illustrate proper shaping. 7. Discuss purpose of cutting undamaged bark by ½ inch. 8. Review concept of ½ inch.

Evaluation	Tools, Equipment and Supplies
1. teacher observation 2. class discussion	1. work gloves 2. bucket
1. teacher observation 2. class discussion	1. hammer or mallet 2. wood chisel 3. work gloves 4. bucket

Unit of Instruction	Student Objectives	Suggested Learning Activities
Dressing the Wound	Given a tree with a properly prepared wound, tree paint, paint brush, and wire brush, the student will be able:	
	1. to use the wire brush correctly.	1. Discuss purpose of using wire brush.
	2. to cover the wound with tree paint.	2. Demonstrate and have students practice using wire brush.
	3. to clean up the area and return all tools.	3. Use Activity Card B 5.
		4. Discuss purpose of using tree paint.
		5. Have students speculate about damage caused if tree paint were not used.
		6. Have students practice using tree paint on old wood scraps.
		7. Discuss need for proper clean up.

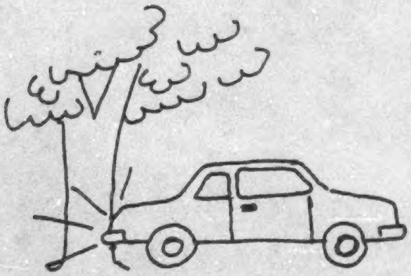
Evaluation	Tools, Equipment and Supplies
1. teacher observation	1. tree paint
	2. paint brush
	3. wire brush
	4. bucket

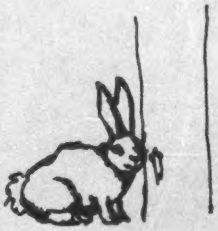
Determining the Need for Repair

GET: paper
pencil

DO: 1. Sometimes the bark on trees gets hurt, or injured. These injuries can happen for many reasons:

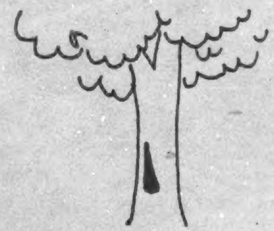
a. Lawn mowers, bikes and cars can hurt the bark.
b. Animals sometimes eat the bark on young trees.
c. Disease or sickness can hurt the bark before or after these other things happen.

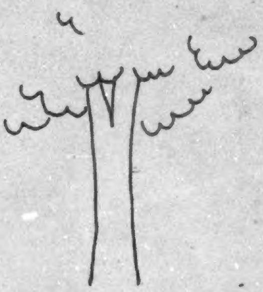




2. List on your paper the reasons that tree bark can be hurt.

3. Which of these trees looks like it has damaged bark?





4. If you put A, you are right. See the place where the bark is hurt?

NOW: 1. Have your teacher check your answers.

NEXT: Go to Activity Card B 2.

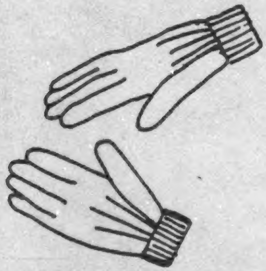
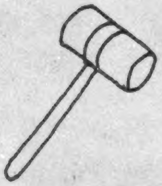
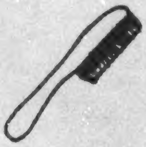
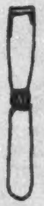
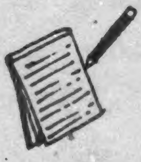
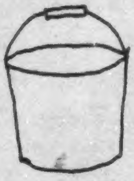
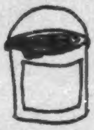
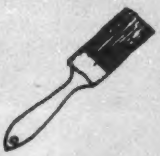
Collecting the Materials

GET:
hammer or mallet
wood chisel
tree paint
paint brush
work gloves
wire brush
bucket
paper, pencil

DO:

1. Gather all of the materials from above.

2. Identify these materials. Write on your paper the names for each one.

3. Check your tools to see if they are clean and are in good condition. If they are not, see your teacher.

4. Remember: When you begin to work, be sure to put your work gloves on.

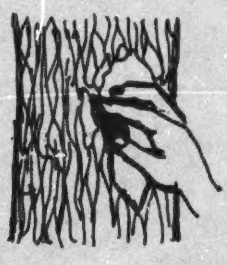
NOW: 1. Have your teacher check your answers.

NEXT: Go to Activity Card B 3.

Removing Loose Bark

GET: you already have the materials

DO:
1. Put on your work gloves!
2. Select a tree with damaged bark that you will work on. Check with your teacher to be sure.
3. Take off the loose bark with your hand. Put it in the bucket so that it won't make a mess on the ground.



4. Be sure not to pull of any of the healthy bark.

NOW: 1. Have your teacher check your work.

NEXT: Go to Activity Card B 4.

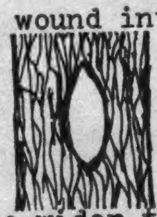
Shaping the Wound

GET: materials from Activity Card B 1

DO:

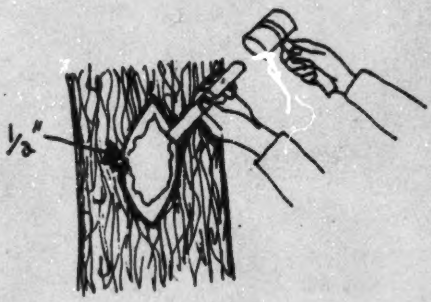
1. To be sure that all of the injured bark is removed you must shape the wound. You shape the wound by using a hammer and chisel.

2. You must shape the wound into this shape:



The sides should be wider than the top or bottom, and the ends should be shaped in a V.

3. Take the chisel and place it on the wood. You should place the chisel 1/2"inch out from the wound. This way you will be sure to be in the undamaged, healthy bark. Use the hammer to tap it through the wood.



4. Continue using the hammer and chisel to shape the wound. Be sure to cut only the bark.

NOW:

1. Have your teacher check your work.
2. Remove the loose bark and put it in the bucket.

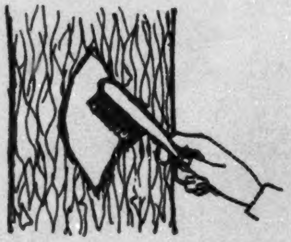
NEXT: Go to Activity Card B 5.

Dressing the Wound

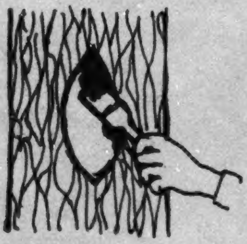
GET: materials from Activity Card B 1

DO:

1. Take the wire brush and lightly brush the surface of the wound. This will help the tree paint stick to the tree.



2. Open the can of tree paint. Put the brush in to get some paint on it.
3. Paint the wound with tree paint. Be sure to cover it well so that the rain and disease can't get in.



NOW:

1. Have your teacher check your work.
2. Clean up the area and return the tools.

NEXT: See your teacher.

Appendix 8

JOB TITLE: Gardening
Groundskeeping

DUTY: Maintaining Plants

TASK: Pruning and Trimming Shrubs

ACTIVITIES:
1. Determining Why Shrubs Need Pruning
2. Determining Which Tools to Use
3. Removing Branches
4. Removing Suckers
5. Sealing All Large Cuts or Wounds

PREREQUISITE SKILLS AND KNOWLEDGE

This module will instruct the student in pruning and trimming shrubs. It will guide the student through learning experiences within the classroom or individually. It cannot, however, provide all prerequisite knowledge for him. A list of prerequisite knowledge follows:

1. identification and use of pruning tools
2. identification of shrubs which need pruning or trimming
3. knowledge of rationale for pruning

VOCABULARY

The teacher should review these words with the student:

PRUNE

IDENTIFY

SHRUB

SELECT

LOPPERS

OVER CROWDED

PROPERLY

SUCKERS

EQUIPMENT

WATERPROOF

INJURE

ACTIVE

WOUND

THINNING

TREE WOUND DRESSING

A CURRICULUM GUIDE FOR

Pruning and Trimming Shrubs

Unit Of Instruction	Student Objectives	Suggested Learning Activities
Determining Why Shrubs Need Pruning	Given paper, pencil and several shrubs from which to choose, the student will be able: 1. to identify shrubs which need pruning. 2. to demonstrate knowledge of the reasons for pruning.	1. Review reasons for pruning. 2. Use sample shrubs and have students determine their individual needs for pruning. 3. Have students discuss and illustrate reasons for pruning and trimming. 4. Show the class examples of damaged and broken shrub branches. 5. Use Activity Card PS 1. 6. Have a guest speaker from a local nursery or university speak to the class about the necessity for pruning. 7. Use Overhead Master 1 for class discussion. 8. Use live plants to show students meaning of good growth. 9. Use Overhead Master 1.
Determining Which Tools to Use	Given a selection of pruning tools and a shrub to prune, the student will be able: 1. to identify specific reasons for pruning his assigned shrub. 2. to select proper pruning tools for pruning his shrub. 3. to inspect tools to insure proper working condition.	1. Review names and uses of each pruning tool. 2. Have students display tools in proper and poor working condition. 3. Have the class make a checklist for tool inspection. 4. Use Activity Card PS 2. 5. Use Overhead Master 2 for class discussion.

Evaluation	Tools, Equipment and Supplies
1. teacher observation 2. correct response to questions on Overhead Master 1	1. paper 2. pencils 3. sample shrubs
1. teacher observation 2. correct answers to Overhead Master 2	1. pruning tools

Unit of Instruction	Student Objectives	Suggested Learning Activities
Removing Branches	Given pruning tools, gloves, a yardstick and a shrub to prune, the student will be able: 1. to determine which branches need pruning or trimming. 2. to plant the pruning cut properly. 3. to identify buds on shrubs.	1. Before the unit begins, cut some forsythia or pussywillow and force budding indoors. 2. Review use of the yardstick. 3. Review proper slant of pruning cut. 4. Have students practice pruning near buds on forsythia or pussywillow branches. 5. Have students practice pruning on dead branches. 6. Use Overhead Master 3. 7. Use Activity Card PS 3. 8. Demonstrate pruning on a live shrub.
Removing Suckers	Given a shrub with suckers, pruning shears and gloves, the student will be able: 1. to distinguish between suckers from shrub branches. 2. to properly remove suckers.	1. Discuss the reasons for sucker removal. 2. Have class illustrate a shrub with suckers, and reasons for their removal. 3. Demonstrate removal of suckers on a live shrub. 4. Have class speculate on what would happen if suckers were not removed. 5. Use Activity Card PS 4. 6. Use Overhead Master 4.

Evaluation	Tools, Equipment and Supplies
1. teacher observation 2. class discussion	1. pruning tools 2. gloves 3. yardstick or ruler
1. teacher observation 2. class answers to questions on Overhead Master 4	1. pruning shears 2. gloves

Unit of Instruction	Student Objectives	Suggested Learning Activities
Sealing All Large Cuts or Wounds	Given a can of tree wound dressing, a stick, gloves and a pruned shrub, the student will be able:	1. Discuss the importance of sealing wounds and large cuts.
	1. to successfully cover all large cuts or wounds with tree wound dressing.	2. Display and discuss a wound which has not been sealed.
		3. Have students practice using tree wound dressing on dead branches.
		4. Discuss the differences between sealing cuts on trees and shrubs.
		5. Use Activity Card PS 5.

Evaluation	Tools, Equipment and Supplies
1. teacher observation	1. pruning shears
	2. gloves
	3. tree wound dressing
	4. a stick

Determining Why Shrubs Need Pruning

GET: paper
pencil

DO: 1. Identify three shrubs which need pruning. Look at each shrub carefully.

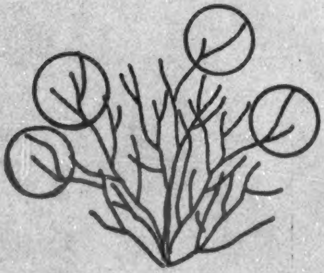
2. Remember, you prune a shrub to:

   A. Make sure that the shrub has a nice shape and good growth.

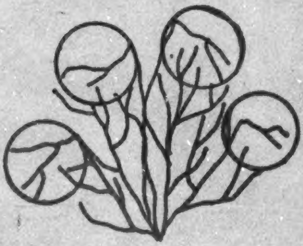
   B. Remove overcrowded, dead or broken branches.

   C. Produce more flower buds.

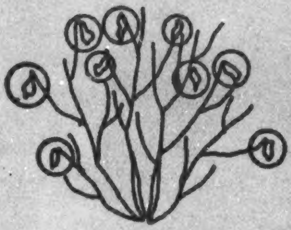
3. List on your paper why each shrub needs pruning. The A, B. or C will show which group your answer is in.



A - Reason: Shrub needs to be shaped



B - Reason: Overcrowded, damaged, and broken branches



C - Reason: Remove dead flowers to produce more buds

NOW: 1. Make sure that you can tell why we prune shrubs.

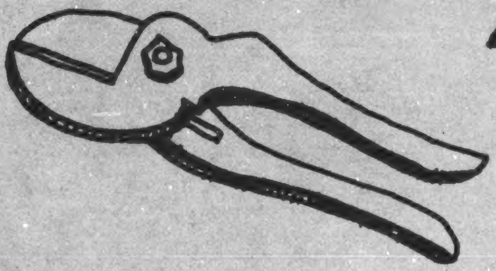
NEXT: Go to Activity Card PS 2.

Determining Which Tools to Use

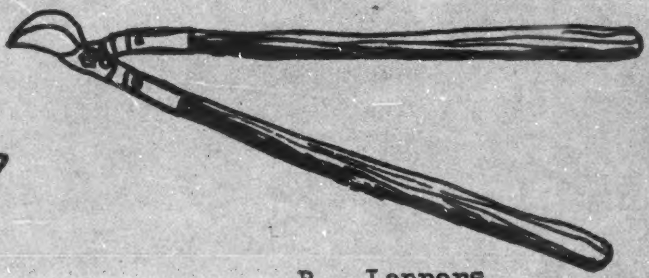
GET: pruning tools

DO: 1. Identify which shrubs you will prune. Be sure to check with your teacher.

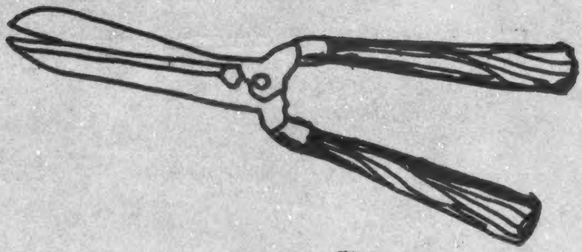
2. Select the tools you will use to prune your shrub.



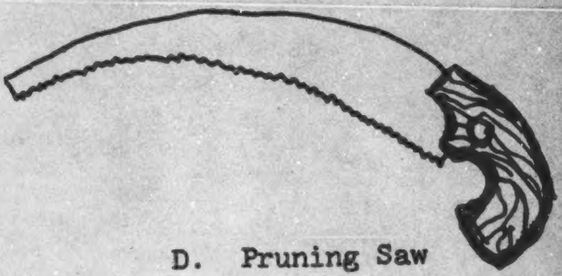
A. Pruning Shears



B. Loppers



C. Hedge Shesrs



D. Pruning Saw

3. Inspect your tools to see if they are ready to use.

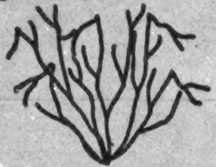
NOW: 1. Check over your tools again.

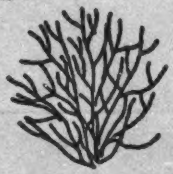
NEXT: Go to Activity Card PS 3.

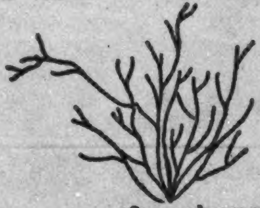
Removing Branches

GET: pruning tools
gloves
yardstick or ruler

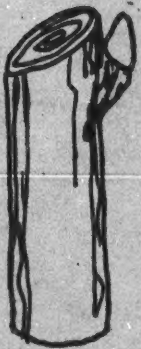
DO: 1. Look at your shrub. Decide which branches need pruning. Look for damaged branches, overcrowded branches, and poorly shaped branches.

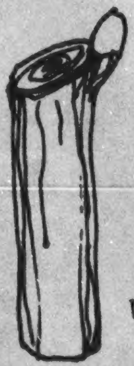

damaged

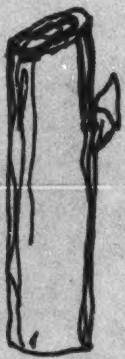

over crowded


poorly shaped

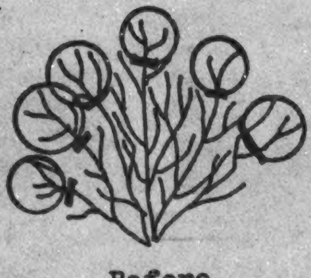
2. Use your pruning shears to cut the branches. Be sure to cut about 1/4 inch above an active bud.

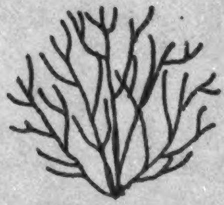

Right


Wrong


Wrong

NOW: Check your work. A properly pruned shrub should look like this:


Before

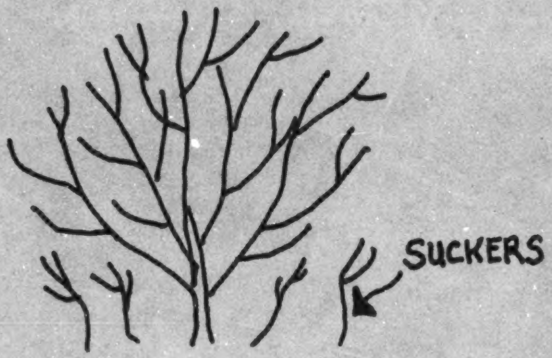

After

NEXT: Go to Activity Card PS 4.

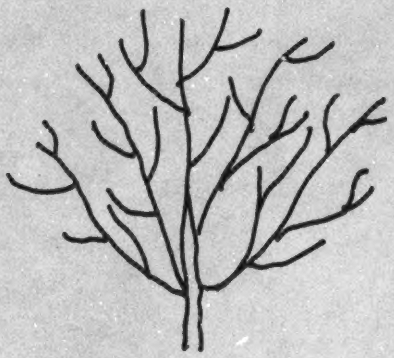
Removing Suckers

GET: pruning shears
gloves

DO: 1. Find a shrub which has suckers. These suckers need to be removed.



2. Use your pruning shears to cut the suckers off at ground level.



NOW: 1. Make sure all of the suckers have been removed.

2. Clean up the area and return your equipment.

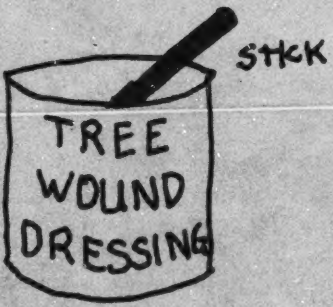
NEXT: Go to Activity Card PS 5.

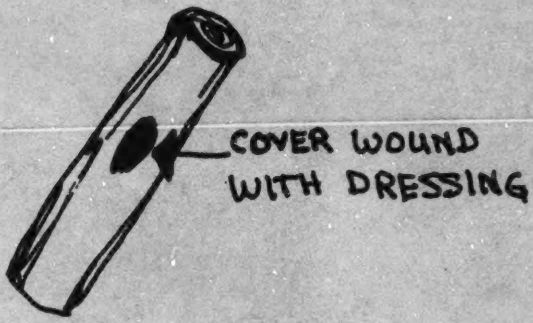
Sealing Large Cuts or Wounds

GET: pruning shears
gloves
tree wound dressing
stick

DO:

1. Large cuts and wounds on shrubs need to be protected. Do this with tree wound dressing.
2. You use tree wound dressing to waterproof the wound, to help prevent decay and promote healing.
3. Take a stick and put it in the can of dressing. Remove some dressing with the stick.
4. Put the dressing on all wounds which need to be covered.





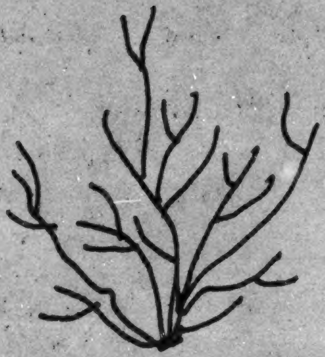
NOW:

1. Make sure all of the wounds have been covered.
2. Put the lid back on the can of dressing and return your tools.

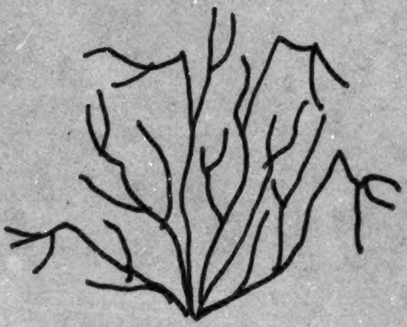
NEXT: See your teacher

OVERHEAD MASTER 1

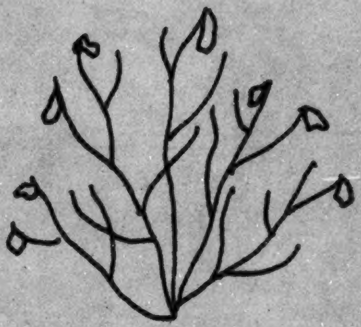
1. YOU PRUNE A SHRUB TO:



SHAPE THE SHRUB

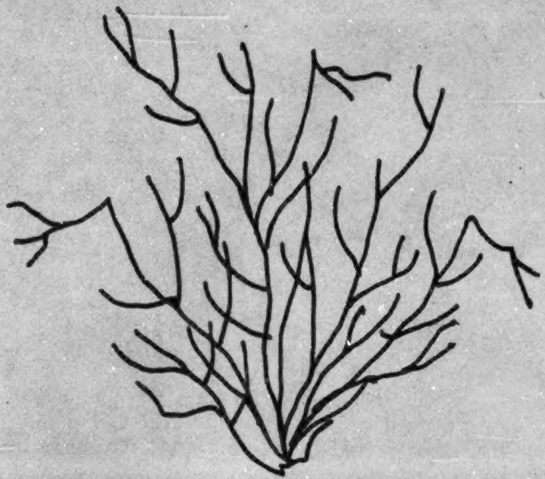


REMOVE OVERCROWDED
DAMAGED AND BROKEN
BRANCHES



REMOVE DEAD
FLOWERS TO PRODUCE
MORE BUDS

SHOULD THIS SHRUB BE PRUNED?



WHY?

OVERHEAD MASTER 2

WHICH TOOLS WOULD YOU USE TO:

A) TRIM A ONE-YEAR-OLD FORSYTHIA BUSH?

B) PRUNE A TEN-YEAR-OLD LILAC?

C) SEPARATE TWO SHRUBS WHICH ARE CROWDING EACH OTHER?

D) REMOVE DEAD BLOSSOMS?

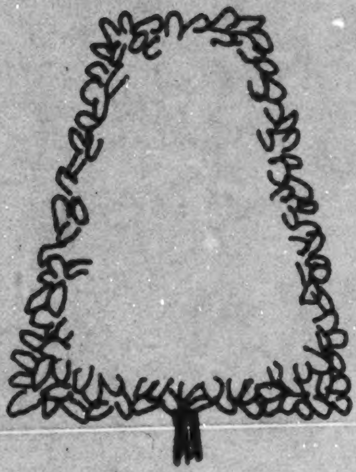
E) REPAIR A STORM DAMAGED SHRUB?

F) SHAPE AN UGLY SHRUB?

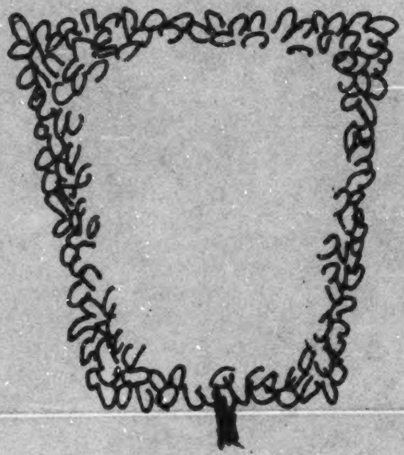
OVERHEAD MASTER 3

PROPER SHRUB SHAPES

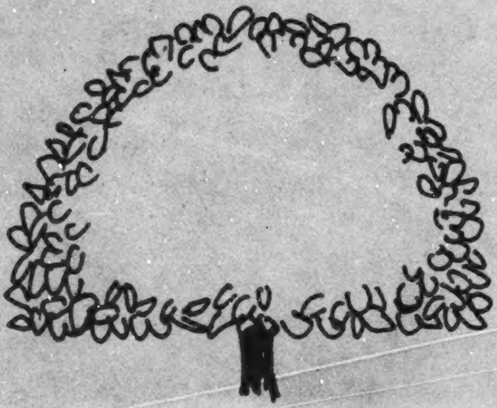
THE BOTTOM OF THE SHRUB MUST ALWAYS BE WIDER THAN THE TOP. THIS LETS THE SUN INTO THE BOTTOM BRANCHES.



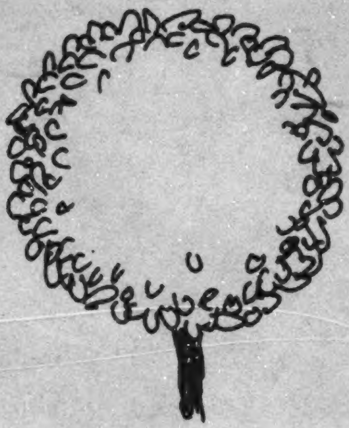
RIGHT



WRONG



RIGHT



WRONG

OVERHEAD MASTER 4

LIST REASONS WHY SUCKERS NEED TO BE REMOVED:

1.

2.

3.

4.

5.

6.

Appendix 9

JOB TITLES: Gardening
Groundskeeping

DUTY: Maintaining Plants

TASK: Protecting Trees from the Weather

ACTIVITIES:

1. Wrapping a Tree
2. Securing the Wrap
3. Getting Ready to Brace Small Trees
4. Pounding the Stake
5. Bracing Small Trees
6. Getting Ready to Brace Larger Trees
7. Pounding the Stakes
8. Bracing Larger Trees

PREREQUISITE SKILLS AND KNOWLEDGE

This module gives the student guidance and direction in learning to protect trees from the weather. It teaches the wrapping and bracing of trees of less than one and more than two inch diameters. While its intention is to instruct students, there are prerequisite skills and knowledge which must preceed the module. A list of these skills follows:

1. use of yardstick
2. measurement of diameter
3. use of simple division
4. use of hammer, mallet, wire cutters and pliers
5. mastery of terms

VOCABULARY

The teacher should review these words with the student:

WRAPPING
BARK
DECAY
TRUNK
TWINE
KNOT
SEVERAL
DIAMETER
BRACE
MEASURE
STAKE
MALLET

HOSE
SOIL RIM
PLIERS
INCH
ANGLE
GUY WIRE
PROTECT
THROUGH
TWIST
TUCK

A CURRICULUM GUIDE FOR

Protecting Trees from the Weather

Unit Of Instruction	Student Objectives	Suggested Learning Activities
Wrapping a Tree	Given a tree and tree wrap paper, the student will be able: 1. to determine where to begin to wrap the tree. 2. to space and secure the tree wrap properly.	1. Discuss with the students the purpose and benefits of wrapping tree trunks. 2. Give each student a twig and a few feet of tree wrap paper for practice purposes. 3. Demonstrate tree wrapping for the students. 4. Use Activity Card TW 1.
Securing the Wrap	Given a tree which has been wrapped with commercial tree wrap, a ball of twine, and scissors, the student will be able: 1. to understand the reasons for using and knotting the twine in the opposite direction of the tree wrap. 2. to successfully wind and knot the twine around the tree.	1. Discuss with the students the purpose and direction of placing the twine. 2. Discuss with the students the reason for knotting the twine. 3. Have students illustrate or build a mock-up of a tree which has been wrapped and secured with twine. 4. Give students some twine to use on the practice twigs they began in the previous unit. 5. Demonstrate using twine for a tree which has been wrapped. 6. Use Activity Card TW 2.

Evaluation	Tools, Equipment and Supplies
1. teacher observation	1. tree wrap paper
1. teacher observation	1. ball of twine 2. scissors

Unit of Instruction	Student Objectives	Suggested Learning Activities
Getting Ready to Brace Small Trees	Given a tree which needs bracing, a yardstick, paper and pencil, the student will be able: 1. to measure the diameter of a tree. 2. to compute the proper length of a stake. 3. to understand the reasons for bracing a tree.	1. Review use of the yardstick in measuring diameter. 2. Review simple division. 3. Discuss the reason for bracing a tree. 4. Have students imagine the results of a tree which is not braced. 5. Demonstrate measurement of tree. 6. Have students illustrate a staked tree. 7. Hold a class discussion on the importance of an appropriate stake. 8. Use Activity Card TW 3.
Pounding the Stake	Given a tree for bracing, a yardstick; stake and hammer or mallet, the student will be able: 1. to properly position and pound the stake for bracing a tree.	1. Review use of yardstick. 2. Discuss the importance of not wounding the tree while pounding in the stake. 3. Demonstrate pounding a stake for the students. 4. Use Activity Card TW 4.

Evaluation	Tools, Equipment and Supplies
1. teacher check of computations for height of stake. 2. teacher observation of measurement.	1. yardstick 2. paper 3. pencil
1. teacher observation	1. yardstick 2. stake 3. hammer or mallet

Unit of Instruction	Student Objectives	Suggested Learning Activities
Bracing Small Trees	Given a tree with a previously pounded stake, pieces of old hose, guy wire, work gloves, wire cutters and a yardstick, the student will be able: 1. to understand the purpose of using rubber hose. 2. to successfully secure the braces to the stake in three places. 3. to clean up the site and return his tools.	1. Discuss the purpose of using rubber hose. 2. Demonstrate how to twist wire. 3. Discuss the safety precautions necessary when using wire cutters. 4. Have students illustrate or build a mock-up of a completely braced tree. 5. Demonstrate Activity Card TW 5 for the students. 6. Use Activity Card TW 5. 7. Discuss proper clean-up of site.
Getting Ready to Brace Larger Trees	Given a tree of over two inches in diameter, a yardstick, and three marking sticks, the student will be able: 1. to measure one foot out from the soil rim. 2. to mark off three places around the tree for positioning stakes. 3. to understand the purpose for bracing a tree.	1. Review use of yardstick. 2. Use Overhead Master 1. 3. Discuss the purposes of bracing a tree. 4. Demonstrate marking off three stakes. 5. Have class decide why three stakes are recommended instead of one, two, or four. 6. Use Activity Card TW 6.

Evaluation	Tools, Equipment and Supplies
1. teacher observation	1. pieces of old hose 2. guy wire 3. work gloves 4. wire cutters 5. yardstick
1. teacher observation	1. yardstick 2. three marking sticks

Unit of Instruction	Student Objectives	Suggested Learning Activities
Pounding the Stakes	Given a tree which needs bracing, previously marked position for stakes, a hammer or mallet, three stakes and work gloves, the student will be able: 1. to correctly angle and pound in three stakes.	1. Demonstrate, or have student demonstrate the proper angle for pounding stakes. 2. Demonstrate pounding a stake. 3. Use Activity Card TW 7.
Bracing Larger Trees	Given a tree which needs bracing, previously pounded stakes, work gloves, guy wire, pieces of old rubber hose, pliers, and wire cutters, the student will be able: 1. to secure guy wires to the tree and stakes. 2. to understand the purpose of using rubber hose. 3. to determine proper flexibility of guy wires. 4. to clean up the site and return his tools.	1. Discuss safety measures of using wire and pliers. 2. Demonstrate how to secure wire by twisting with pliers. 3. Use Activity Card TW 8. 4. Have students determine why the top wire is put above the last set of branches. 5. Demonstrate attachment of wire to tree and to stake. 6. Have students illustrate a properly staked tree. 7. Discuss proper clean up of site.

Evaluation	Tools, Equipment and Supplies
1. teacher observation	1. three stakes 2. hammer or mallet 3. work gloves
1. teacher observation 2. teacher check of firmness of guy wires	1. work gloves 2. spool of guy wire 3. three pieces of rubber hose 4. pliers 5. wire cutters

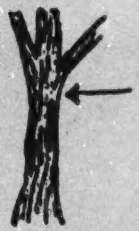
Wrapping a Tree

GET: tree wrap paper

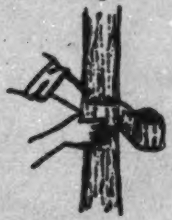
DO: 1. With your teacher's help, select a tree that needs to be wrapped.

2. We wrap trees with thin, smooth bark to protect them from drying winds and sunshine of winter. The wrap is left on for about two years, or until it decays.

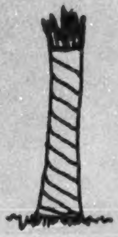
3. To begin to wrap a tree you start at its lowest branch.



4. Place the wrap on the trunk and wrap it around the trunk two times to secure the wrap.



5. Now start wrapping the rest of the tree. Wind the tree wrap down the tree. Be sure that the edges of the wrap overlap each other by 1 inch.



NOW: 1. Secure the wrap by putting it around the trunk a few times and tucking it in the end.

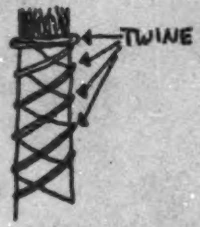
NEXT: Go to Activity Card TW 2.

Securing the Wrap

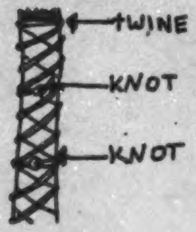
GET: ball of twine
scissors

DO:

1. Make sure that you have finished Activity Card TW 1.
2. Tie the twine around the tree wrap at the top. Be sure you make a good knot.
3. Begin to wind the twine around the tree in the opposite direction of the wrap.



4. As you wind the twine down the tree, you should stop a few times and tie a knot with the twine. This will prevent the twine from coming undone.



5. Finish winding the twine on the tree.
6. At the bottom you should tie the twine and knot it several times. Then you should cut the twine from the ball.

NOW:

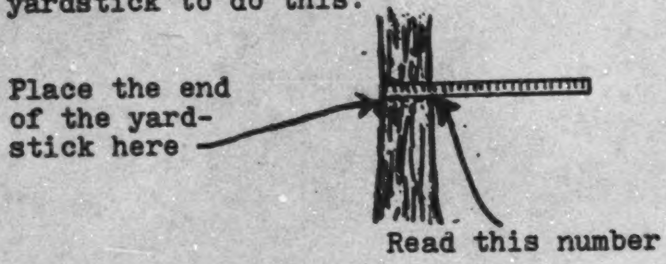
1. Pick up your tree wrap, twine, and scissors and put them away.
2. Have your teacher check your work.

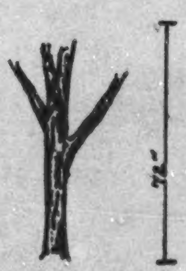
NEXT: Go to Activity Card TW 3.

Getting Ready to Brace Small Trees

GET: yardstick
paper
pencil

DO: 1. First, measure the diameter of the tree's trunk. Use the yardstick to do this.


Place the end of the yardstick here
Read this number



2. If the diameter of the tree is more than 2 inches, go to Activity Card TW 6.

3. We brace a tree so that it can grow properly. If the wind moves it too much, the roots will not be able to grow. The brace helps keep the tree steady.

4. Measure the height of the tree. Be sure your yardstick is straight.

5. Write down your measurement. Divide it by two. Add 24 inches to this number.

Example:

36 inches
2/72 inches
6
12
12
0

36 inches
+ 24 inches
60 This is how many inches long the stake should be.

6. This total is how long the stake should be.

7. Select a stake that is the right length.

NOW: 1. Have your teacher check the length of your stake.
2. You are ready to brace the tree.

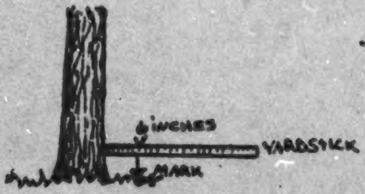
NEXT: Go to Activity Card TW 4.

Pounding the Stake

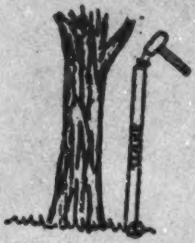
GET: yardstick
stake
a hammer or mallet

DO:

1. On the ground, measure 6 inches out from the tree trunk.
2. Mark that spot.



3. Get the stake and a hammer or mallet for pounding it in.
4. Pound in the stake until it is about half as high as the tree.



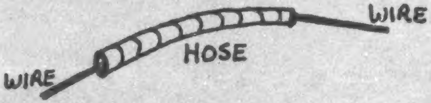
NOW: 1. Have your teacher check what you have done.

NEXT: Go to Activity Card TW 5.

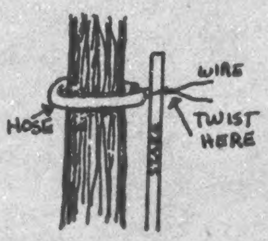
Bracing Small Trees

GET: pieces of old hose that are 8 inches long
pieces of guy wire that are 24 inches long
work gloves
wire cutters
yardstick

DO: 1. Put one end of the wire through one piece of hose. The hose protects the tree trunk.



2. Wrap the hose with the wire through it around the tree. You should place the hose about 3 inches down from the top of the stake. You might want to measure this with your yardstick. Be sure to wear your gloves.



3. Twist the wire around the stake several times. Be sure that it won't come undone. Cut off the ends.

4. Repeat steps 2 and 3 at the bottom of the tree.

5. Repeat steps 2 and 3 in the middle of the tree trunk.

NOW: 1. Pick up your tools and pieces of wire.

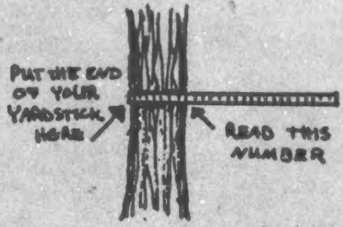
2. Have your teacher check your work.

NEXT: See your teacher.

Getting Ready to Brace Larger Trees

GET: yardstick
3 sticks

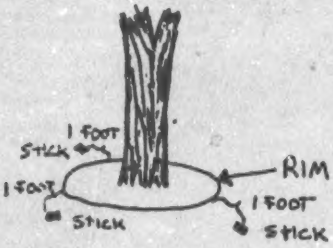
DO: 1. Measure the diameter of the tree trunk. If it is under 2 inches, go back to Activity Card TW 3.


PUT THE END OF YOUR YARDSTICK HERE
READ THIS NUMBER

2. We brace a tree so that it can grow properly. If the wind moves it too much, the roots will not be able to grow. Trees over 2 inches in diameter are braced with three guy wires. They help keep the tree steady.

3. Measure one foot out from the soil rim of the tree. Put the first stick here.

4. Repeat step 3 in two other places around the soil rim. When you are done, the sticks should be spread evenly around the rim.


1 FOOT
STICK
1 FOOT
STICK
RIM
1 FOOT
STICK

NOW: 1. You are ready to pound the stakes.

NEXT: Go to Activity Card TW 7.

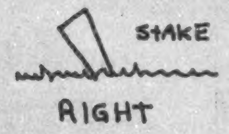
Pounding the Stakes

GET: three stakes
hammer or mallet
work gloves

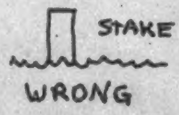
DO:

1. Check to see that the three sticks are spread evenly outside of the rim. You will pound the stakes where these sticks are.

2. Put on your work gloves. Take one stake and the hammer or mallet and place the stake by a stick. Pound the stake into the ground at an angle, not straight up and down. The top of the stake should be away from the tree.



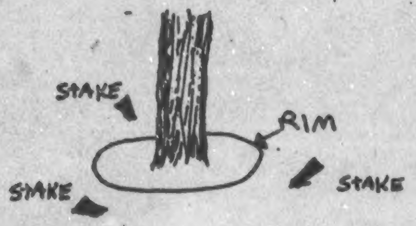
RIGHT



WRONG

3. Pound in the stake until about 6 inches are left on top of the ground.

4. Repeat step 3 with the other two stakes. When you are finished, it should look like this.



NOW:

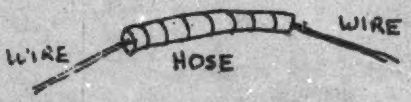
1. Have your teacher check your work.
2. Pick up the sticks and put them away.

NEXT: Go to Activity Card TW 8.

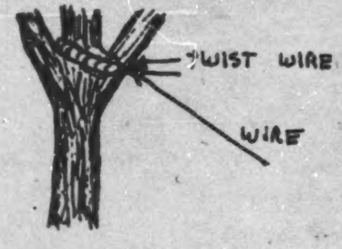
Bracing Larger Trees

GET: work gloves
spool of guy wire
three pieces of old rubber hose
pliers
wire cutters

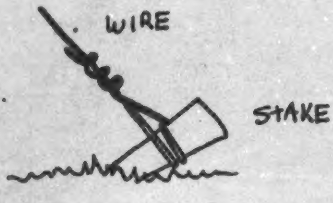
DO: 1. Be sure to wear your gloves. Put one end of the wire through one piece of hose. The hose protects the tree trunk.



2. Place the hose above the bottom branches. Wrap the hose with the wire through it around the tree. Take the short end of the wire and twist it around the long wire. Be sure that it is tight.



3. Take the long end of the wire and wrap it around the stake two times. Then twist the wire ends together.



4. Be sure that the wire is not too tight. The tree should be able to move a little.

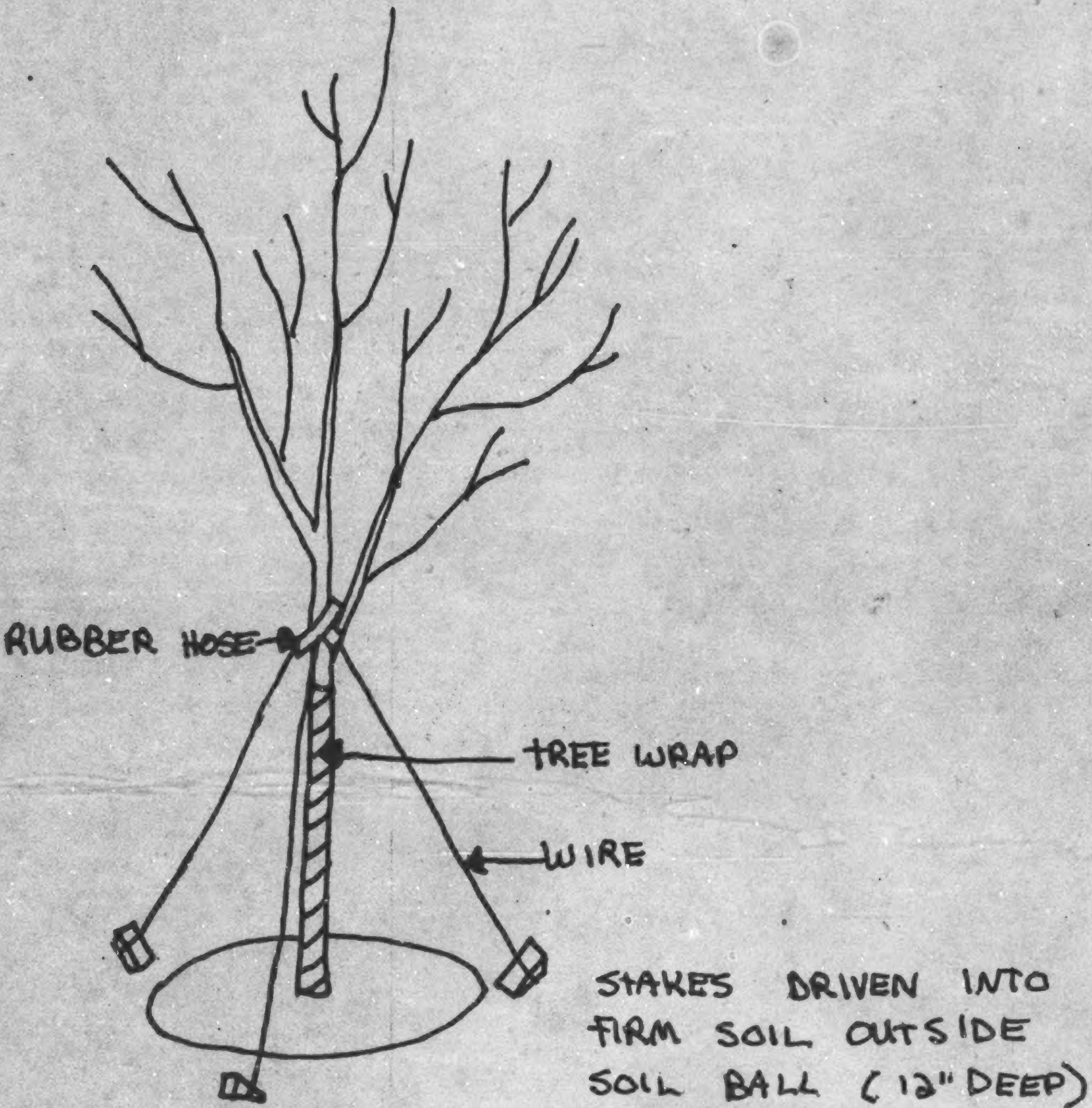
5. Repeat steps 2, 3 and 4 for each of the other stakes.

NOW: 1. Check the guy wires again. They should be firm but not tight.

2. Pick up and return your tools.

NEXT: See your teacher.

Overhead Master 1


RUBBER HOSE
TREE WRAP
WIRE
STAKES DRIVEN INTO FIRM SOIL OUTSIDE SOIL BALL (12" DEEP)

Appendix 10

JOB TITLE: Engine Tune-Up Specialist

DUTY: Check the Mechanical Condition of the Engine

TASK: Measuring the Cylinder Compressions and Determining the Condition of the Valves

ACTIVITIES:

1. Prepare the Engine for the Compression Test
2. Install the Remote Starting Switch
3. Engine Compression Test
4. Compression Test Results
5. Wet Compression Test
6. Remove the Compression Test Equipment

PREREQUISITE SKILLS AND KNOWLEDGE

This module directs the student to perform numerous tasks. It is assumed that the student has certain basic knowledge and skills that are essential for the successful completion of these activity cards. The prerequisite knowledge and skills are as follows:

1. Removal and installation of the air cleaner.
2. Removal and installation of the spark plugs.
3. Connection of the spark plug leads.
4. Determination of the polarity of the battery terminals.
5. Use of the motor manual.

VOCABULARY

The teacher should review these words with the student:

ENGINE WARM UP

THROTTLE SPRING

LINKAGE

DISTRIBUTOR TOWER

JUMPER WIRE

REMOTE STARTING SWITCH

STARTER SOLENOID

COMPRESSION

COMPRESSION TESTER

GAUGE

VALVE

COMPRESSION RING

HEAD GASKET

A CURRICULUM GUIDE FOR

Measuring the Cylinder Compressions
- And Evaluating the Condition
# of the Rings and Valves

Unit Of Instruction	Student Objectives	Suggested Learning Activities
Prepare the Engine for Compression Test	Given an automobile, the student will be able: 1. to prepare an automobile for measurement of cylinder pressures.	1. Demonstrate different methods of securing the throttle valve in the full open position. 2. Use Activity Card CT 1.
Install the Remote Starting Switch	Given an automobile and a remote starting switch, the student will be able: 1. to locate the starter solenoid and connect the remote starting switch so that the engine will crank but will not start.	1. Demonstrate and then have the students install a remote starting switch on at least one of each of the GM, Ford, and Chrysler cars. 2. Use Activity Card CT 2.
Engine Compression Test	Given a properly prepared engine and a compression guage, the student will be able: 1. to use the compression guage to measure cylinder pressures. 2. to read and record the pressures in all of the cylinders for the first and the fourth strokes.	1. Demonstrate the method of measuring compression. 2. Have the student repeat the measuring and recording procedure on the same cylinder until reliable results (± 5 psi) are obtained. 3. Use Activity Card CT 3.

Evaluation	Tools, Equipment and Supplies
1. Check that the choke valve is open and that the throttle valve has been fixed in the full open position.	common pliers
2. Check that the distributer high voltage lead is securely grounded to the engine.	electrical jumper wire
3. Check that all spark plugs have been removed from the engine.	air hose air blow gun spark plug rack safety goggles spark plug socket extension ratchet spark plug boot puller
1. Check that one wire of the remote Starting switch is connected to the + terminal of the battery and that the other wire is connected to the start (S) terminal of the solenoid.	remote starting switch
1. Check the student's pressure valves for at least one cylinder.	compression tester

Unit of Instruction	Student Objectives	Suggested Learning Activities
Compression Test Results	Given a table of compression valves for an engine, the student will be able: 1. to diagnose the probable condition of the engine cylinders.	1. Prepare several different tables of compression valves that show typical cylinder compression problems and have the student diagnose these problems in class. 2. Use Activity Card CT 4.
Wet Compression Test	Given an engine with one or more low cylinder pressures, the student will be able: 1. to differentiate between valve and ring problems.	1. Demonstrate the injection of oil into the cylinders and explain how the oil forms a temporary seal on the rings. 2. Show how the oil raises the compression readings of cylinders with worn rings. 3. Use Activity Card CT 5.
Remove the Compression Test Equipment	Given a complete compression test set up, the student will be able: 1. to remove all test equipment from the engine. 2. to return the engine to running configuration.	1. Demonstrate the safe removal of test equipment and tools from the engine compartment. 2. Challenge the students to develop a checklist of all the steps necessary to return the engine to proper running configuration. 3. Use Activity Card CT 6.

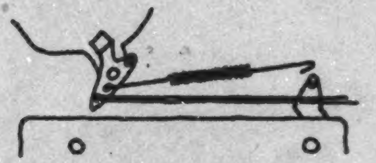
Evaluation	Tools, Equipment and Supplies
1. Confirm or deny the student's evaluation of the condition of the engine. Explain the reasoning.	pencil paper
1. Confirm the student's diagnosis of a ring or valve problem.	pump oil can compression tester S.A.E. 30 motor oil (in oil can)
1. Visually check the engine compartment for safety items and then have the student start or attempt to start the engine from the driver's seat.	

Prepare the Engine for the Compression Test

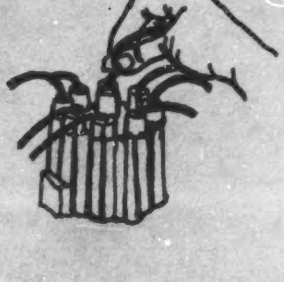
GET: Reference:
1. Activity Card SP 6 (Remove the Air Cleaner)
2. Activity Card SP 1 (Remove the Spark Plugs)

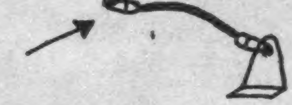
Equipment:
1. short jumper wire
2. common pliers

DO:
1. Run the engine until it is warmed up.
2. Shut off the ignition switch.
3. Remove the air cleaner. (Do Activity Card SP 6).
4. Unhook one end of the throttle spring from its bracket.



5. Push on the accelerator linkage until the throttle is wide open.
6. Prop or wedge the throttle linkage in the open position.
7. Pull the end of the high voltage wire from the center tower of the distributor with your fingers.





Prepare the Engine for the Compression Test
(CONTINUED)

8. Connect this end of the high voltage wire to a metal part of the engine with a jumper wire.
   Warning: If the high voltage wire is not removed from the distributor it may shock you during the test.

9. Remove the spark plugs. (Do Activity Card SP 1)

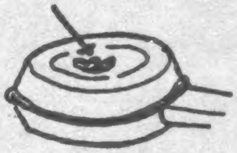
NOW: 1. Check that you can see through the carburetor into the intake manifold. Both the choke and the throttle valve should be wide open.

NEXT: Do Activity Card CT 2. (Install the Remote Starting Switch).

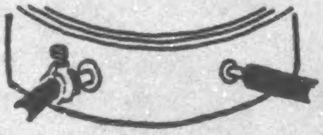
Remove the Air Cleaner

GET: Tools
1. screwdriver

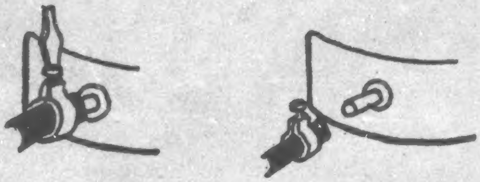
DO: 1. Remove the wing nut from the top of the air cleaner.



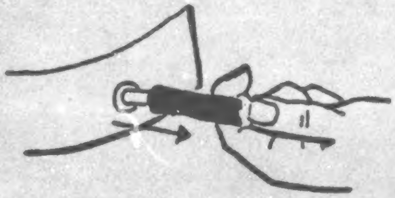
2. In order to remove the air cleaner, you must disconnect all of the tubes and hoses from the air cleaner. Some of these have clamps on them and some do not have clamps. Find those hoses with clamps and those without clamps.



3. If the hose has a clamp, loosen the clamp with a screwdriver. **Note:** Leave the clamps in place on the hoses.

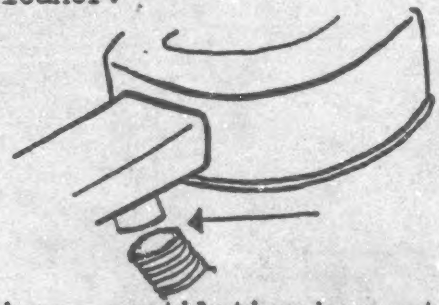


4. If the hose does not have a clamp, you can remove it by pulling down on the hose. Hold the hose at the point where it joins the air cleaner.

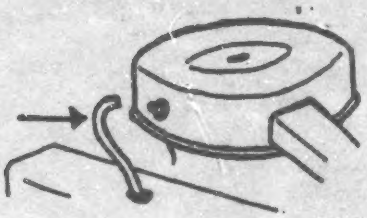


Remove the Air Cleaner
(CONTINUED)

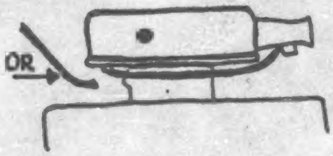
5. Disconnect the hot air tube at the air cleaner.
   Note: Remember or mark the connection point for each hose on the air cleaner.



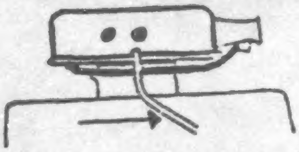
6. Disconnect the crankcase ventilation hose at the side of the air cleaner.



7. Disconnect the hot air modulator vacuum hose at the air cleaner.



8. Disconnect the fuel tank vapor hose at the air cleaner.



9. Lift the air cleaner shell from the engine.

NOW: 1. Check to see that you know where all the hoses connect.

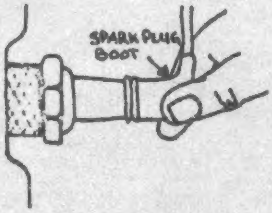
Remove Spark Plugs

GET: Hand Tools:
1. spark plug socket
2. extension cord
3. ratchet
4. spark plug boot puller

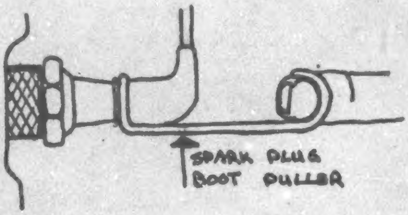
Equipment:
1. air hose
2. air blow gun
3. spark plug rack
4. safety goggles

DO: 1. Turn the ignition switch "OFF" and remove the key.
Warning: Engine start during work could injure the mechanic.

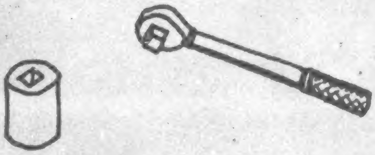
2. Twist each plug boot 1/4 turn to break the seal.



3. Pull each wire off of its spark plug by pulling on the spark plug boot puller.
Caution: Do not jerk or pull on the spark plug wire.

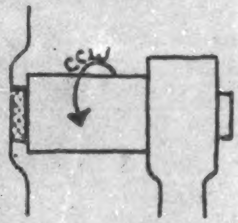


4. To remove the spark plugs, you will need the spark plug socket and ratchet.

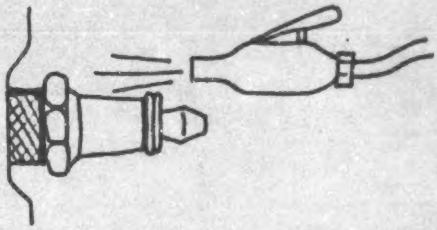


Remove Spark Plugs
(CONTINUED)

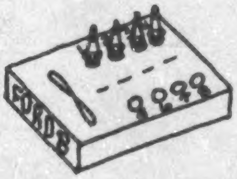
5. Turn each plug 1 counter clockwise (CCW) turn with the spark plug socket ratchet.



6. Blow dirt out of each spark plug well with a blast from the blow gun.
   Warning: Wear safety goggles to keep the dirt out of your eyes.



7. Remove each spark plug with the spark plug socket and ratchet and place it in the proper hole of the spark plug rack.



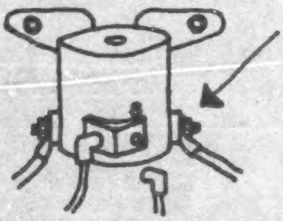
NOW: 1. Have your teacher check your work.

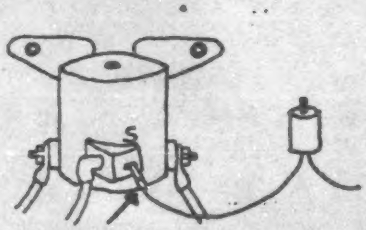
Install the Remote Starting Switch (Ford)

GET: Equipment:
1. remote starting switch

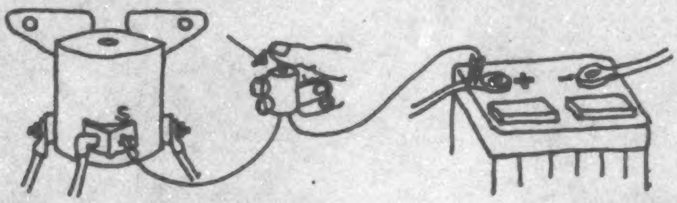
DO:

1. Check that the ignition switch is turned "OFF".
2. Clamp either wire of the remote starter switch to the positive post of the battery.
3. Locate the starter solenoid on the right fender well.
4. Disconnect the wire from the solenoid start terminal marked S.





5. Connect the other wire of the remote starter switch to the solenoid start terminal.
6. Push the remote start switch and see if the starter will crank the engine.
   Note: The engine will crank but it will not start.



7. If the engine does not crank, do steps 1, 2, 3, 4, 5, and 6 again.

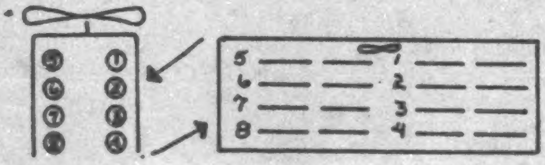
NOW: 1. If the engine still does not crank, see your instructor.

NEXT: Do Activity Card CT 3 (Engine Compression Test).

Engine Compression Test

GET: Reference:
1. motor manual
Equipment:
1. compression tester
2. pencil and paper

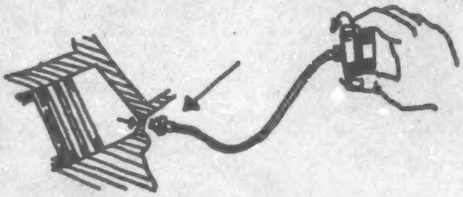
DO: 1. In the motor manual, find the motor diagram showing the numbers of the cylinders of your engine.



2. Make a sketch on the piece of paper showing where each cylinder is located.

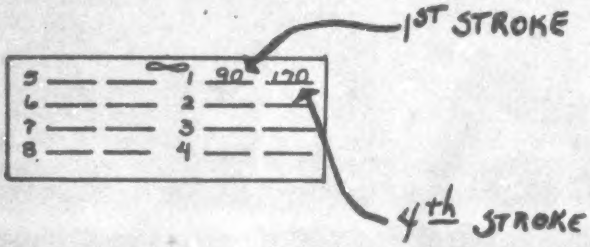
3. Turn the ignition switch "ON".

4. Screw the compression tester into the spark plug hole until it is finger tight.



5. Crank the engine and count 4 compression strokes.

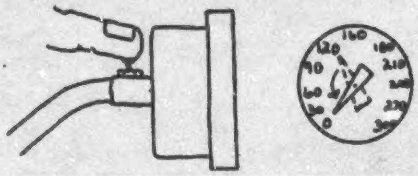
6. Remember the pressure from the first full stroke and write it on the paper by the proper cylinder number.



Engine Compression Test
(CONTINUED)

7. Read the pressure on the gauge from the fourth stroke and write it on the paper.

8. Press the valve behind the gauge and the pressure will go to zero.



9. Do steps 4, 5, 6, 7, and 8 for each cylinder on the engine.

NOW: 1. Check your paper and see that you have two pressures for each cylinder.

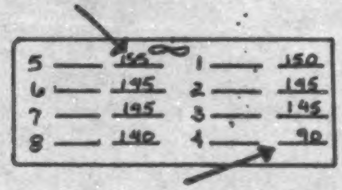
NEXT: Do Activity Card CT 4. (Compression Test Results).

Compression Test Results

GET: Reference:
1. motor manual

DO: 1. Get the paper with the cylinder pressures that you made for card CT 3.

2. Find the highest pressure from the fourth stroke.



3. Find the lowest pressure from the fourth stroke.

4. How much bigger is the highest pressure?

5. If the difference is 15 or smaller, go to step 7.

6. If the difference is more than 15, do a Wet Compression Test now. (Activity Card CT 5)

7. Find the engine cylinder pressure in your engine manual.

(Check with your teacher to see that you are right.)

8. If the pressures on your paper are the same or higher than the pressures in the engine manual, the rings and valves of the engine are okay.

9. If the pressures are low, see your teacher.

NOW: 1. Show your paper to the instructor and tell him what you have learned about the condition of the cylinders.

NEXT: Do Activity Card SP 5. (Install the Spark Plugs).

Install the Spark Plugs

GET: Hand Tools:
1. spark plug socket
2. extension
3. ratchet
4. torque wrench

Reference:
1. motor manual

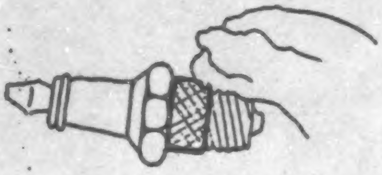
DO: 1. Check spark plug number with the motor manual list.

(Check with your teacher to see that you are right.)

2. Get the spark plug torque setting from the motor manual. You will need this for step 8.

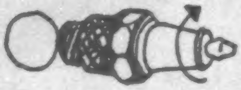
(Check with your teacher to see that you are right.)

3. Wipe the spark plug threads clean with a slightly oiled mechanic's rag.



4. Find the spark plug hole in the cylinder head.

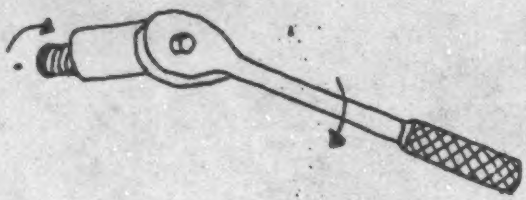
5. Line up the spark plug with the hole in the cylinder head and start the threads by turning clockwise.



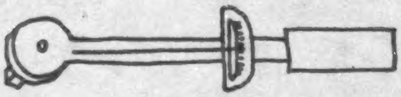
Install the Spark Plugs
(CONTINUED)

6. Turn the spark plug at least two full turns with your fingers. If the spark plug does not turn easily, take it out and start again.

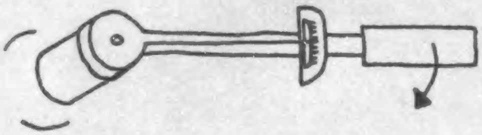
7. Get the spark plug socket and ratchet. Use these to turn the spark plug until it is lightly seated.
   Caution: Do not use force when turning the ratchet.



8. Get the torque wrench.



9. Use the spark plug socket and torque wrench to tighten the spark plug to the torque setting from the motor manual. (You found the torque setting in step 2).



10. Install the rest of the spark plugs by doing steps 3 through 9.

NOW: 1. Check that you have installed a spark plug in each cylinder.

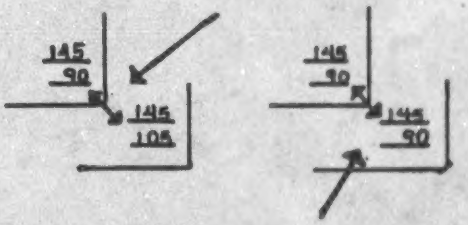
Wet Compression Test

GET: Equipment:
1. pump oil can
2. compression tester

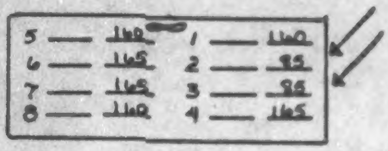
Supplies:
1. S.A.E. 30 motor oil

DO:

1. Pour or squirt one teaspoon of motor oil into each cylinder.
2. Crank the motor 4 or 5 strokes.
3. Do Activity Card CT 3 again, (Engine Compression Test).
4. If the pressures of the low cylinders increase 10 or more pounds, the problem is probably worn or broken rings. See your instructor.



5. If the pressures of the low cylinders do not increase, the problem is probably burned or stuck valves. See your instructor.
6. If very low pressures are measured only on two cylinders which are next to each other, the problem is probably a blown head gasket. See your instructor.



5 —— 160
6 —— 165
7 —— 165
8 —— 160

1 —— 160
2 —— 95
3 —— 95
4 —— 165

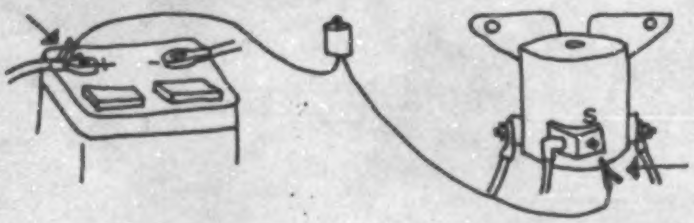
NOW: 1. Show your paper with the compression readings to your instructor and tell him what you think is wrong with the cylinders.

NEXT: Do Activity Card CT 6. (Remove the Compression Test Equipment).

Remove the Compression Test Equipment

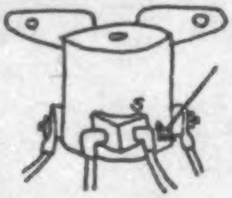
GET: Reference:
1. Activity Card SP 5. (Replace the Spark Plugs)
2. Activity Card SP 7. (Connect the Spark Plug Leads)
3. Activity Card SP 8. (Replace the Air Cleaner)

DO: 1. Disconnect the remote starting switch from the positive terminal of the battery.



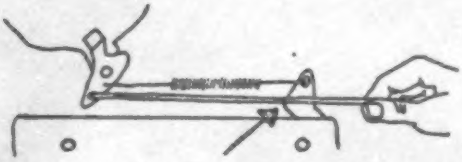
2. Disconnect the other remote starting wire from the start terminal (S) of the solenoid.

3. Reconnect the starting wire to the start terminal (S) of the solenoid.



4. Remove the prop or wedge from the throttle linkage.

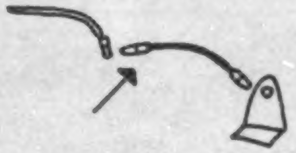
5. Pull on the throttle linkage until the throttle valve is closed.



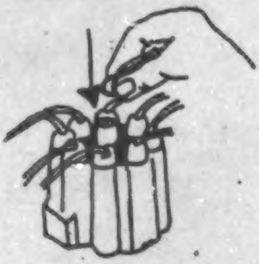
6. Reconnect the throttle spring to its bracket.

Remove the Compression Test Equipment
(CONTINUED)

7. Remove the jumper wire from the distributor high voltage wire and from the engine.



8. Push the end of the distributor high voltage wire into the center tower of the distributor cap.



9. Replace the spark plugs. (Do Activity Card SP 5).
10. Connect the spark plug leads. (Do Activity Card SP 7).
11. Replace the air cleaner. (Do Activity Card SP 8).

NOW: 1. Return your equipment to the proper rack.

NEXT: Have your instructor check your work.

Connect the Spark Plugs

GET: Hand tools:
1. pliers
References:
1. motor manual

DO: 1. Find your motor in the motor manual.

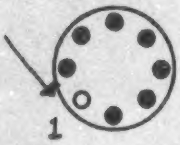
(Check with your teacher to see that you are right.)

2. Find the cylinder numbers for your motor in the motor manual.

(Check with your teacher to see that you are right.)

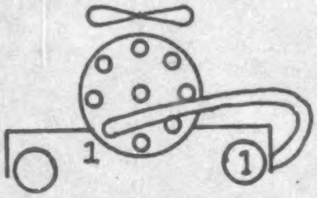
3. Mark the number on each cylinder with a piece of chalk.

4. Look in the motor manual and find the location of the number 1 wire on the distributor cap.

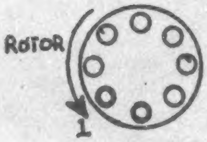


Connect the Spark Plugs
(CONTINUED)

5. Find that wire on your distributor cap and follow along the wire and connect it to the number 1 cylinder spark plug.



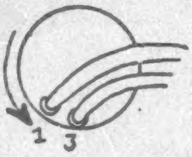
6. Find the direction that the distributor rotor turns from the motor manual.



7. Get the engine cylinder firing order from the motor manual.

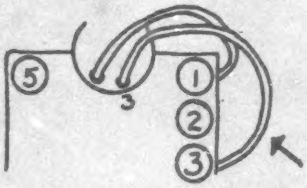
(Check with your teacher to see that you are right.)

8. Going around the distributor in the direction that the rotor turns, find the very next wire after the number 1 wire.

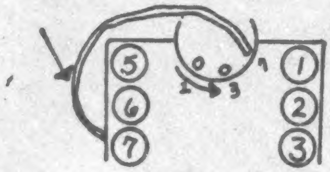


Connect the Spark Plugs
(CONTINUED)

9. Follow along this wire and connect it to the cylinder whose number is the same as the second number in the firing order.

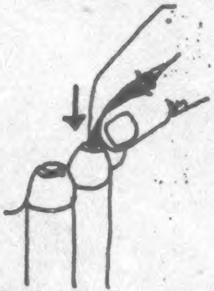


10. Going around the distributor in the direction of rotation, find the next wire. Follow along this wire and connect it to the spark plug of the next cylinder in the firing order.

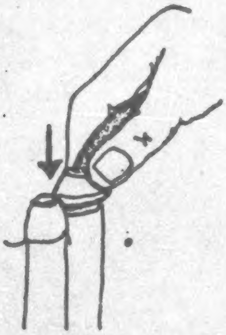


11. Repeat steps 8 through 10 for each of the remaining spark plug wires.

12. Push each of the wires down into the distributor towers firmly.

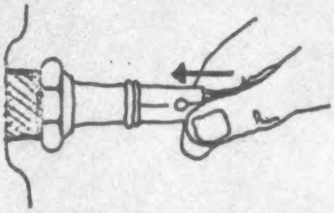


13. Push each of the wire boots down on the distributor towers firmly.

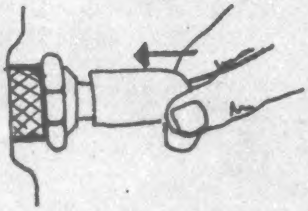


Connect the Spark Plugs
(CONTINUED)

14. Push each of the wires firmly onto the spark plugs.



15. Push each of the spark plug boots firmly onto the spark plug.



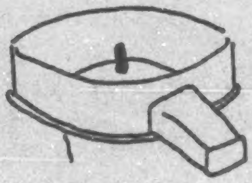
NOW: 1. Check that each spark plug has a high voltage wire connected.

Replace the Air Cleaner

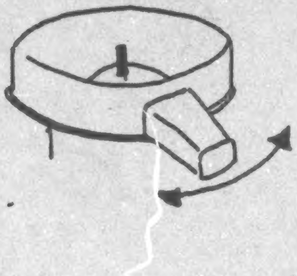
GET:
1. bottom and top of air cleaner
2. wing nut
3. air filter

DO:

1. Place the bottom part of the air cleaner on the carburetor.

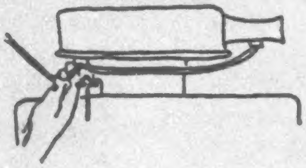


2. Rotate the air cleaner back and forth until you feel it lock into place.

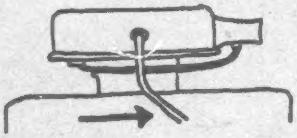


3. Connect all of the hoses to the air cleaner. If the hoses have clamps, tighten the clamps with a screwdriver.

4. Push the hot air modulator vacuum hose onto the air cleaner.

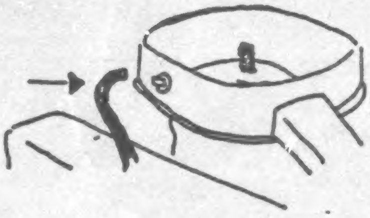


5. Push the fuel tank vapor cannister hose onto the air cleaner connection.

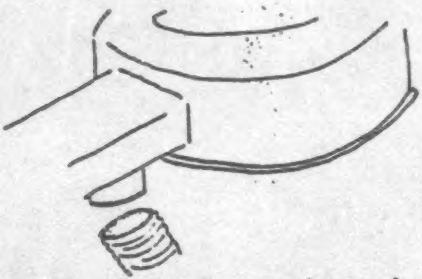


Replace the Air Cleaner
(CONTINUED)

6. Push the end of the crankcase ventilation hose onto the crankcase filter nipple.

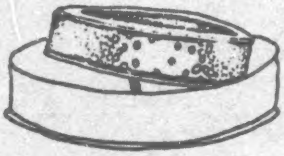


7. Push the end of the hot air tube onto the air cleaner.

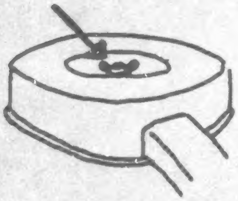


8. Check to make sure that all hoses have been attached tightly to the air cleaner. Also, be sure that all clamps have been tightened.

9. Put the air filter in the air cleaner.



10. Put the top on the air cleaner and tighten the wing nut finger tight.



NOW: 1. Check that all hoses are in the right place. Check that the air cleaner will not rotate.

Appendix 11

JOB TITLE: Engine Tune-Up Specialist

DUTY: Maintain the Ignition System

TASK: Test, Remove and Replace the Ignition Contact Set and Adjust the Dwell and Timing

ACTIVITIES:

1. Visual Test of the Ignition Points
2. Resistance Test of the Ignition Points
3. Remove Ignition Contact Set and Condenser
4. Install Contact Set and Condenser
5. Dwell Test and Adjustment, Cranking
6. Dwell Test and Adjustment, Idling
7. Setting the Ignition Timing

PREREQUISITE SKILLS AND KNOWLEDGE

This module directs the student to perform numerous tasks. It is assumed that the student has certain basic knowledge and skills that are essential for the successful completion of these activity cards. The prerequisite knowledge and skills are as follows:

1. Removal and installation of the air cleaner.
2. Connection of the shop dwell tachometer to the motor.
3. Use of the engine manual.
4. Use of the feeler gauge.
5. Warm up of an engine.
6. Connection and operation of the timing light.

Vocabulary Words

The teacher should review these words with the student:

LATCHES
DISTRIBUTOR CAP
DISTRIBUTOR CAP TOWER
CONTACT SET
CONDENSER
ROTOR
RESISTANCE
"BUMP" THE STARTER
DWELL TACHOMETER
FULL SCALE
JUMPER WIRE
HIGH VOLTAGE LEAD
IGNITION WRENCH

DISTRIBUTOR PLATE
MOUNTING POST
FEELER GAUGE
DISTRIBUTOR CAM
CAM LOBE
DWELL ANGLE
DWELL METER
TIMING MARKS
DAMPER PULLEY
INDEX MARKER
TIMING LIGHT
DISTRIBUTOR WRENCH
CAM GREASE

A CURRICULUM GUIDE FOR

Test, Remove and Replace the Ignition Contact Set and Adjust the Dwell and Timing

Unit Of Instruction	Student Objectives	Suggested Learning Activities
Visual Test of the Ignition Points	The student will be able: 1. to gain access to the contact set in the distributor by removing the distributor cap and rotor. 2. to determine the serviceability of the contact set from visual examination. 3. to return the distributor to running configuration.	1. Have the student examine and remove the cap of a number of different types of distributors either in the classroom or in the shop. 2. Provide the student with a mixed number of serviceable and unserviceable contact sets and ask him to judge their condition. 3. Have the student replace and latch the caps on the different types of distributors. 4. Use PT 1.
Resistance Test of the Ignition Points	The student will be able: 1. to properly ground the high voltage lead. 2. to determine when the points of the contact set are closed. 3. to determine if the resistance of the points is acceptable or too high.	1a. Show the student how to identify the high voltage lead in the center tower of the distributor cap. 1b. Demonstrate the use of a jumper wire to ground the high voltage lead. 2. Demonstrate how a swell meter indicates that the points of the contact set are closed. 3a. Use a spare distributor with contact set and primary wire and the points function of a tune up tester to locate an open or a high resistance connection in the primary or ground wire. 3b. Demonstrate the difference in "points" readings between a good contact set and a defective contact set. 4. Use PT 2.
Remove Ignition Contact Set and Condenser	The student will be able: 1. to gain access to the contact set and condenser by removing the distributor cap and the rotor 2. to electrically disconnect the condenser and the contact set. 3. to remove the contact set and condenser from the distributor plate.	1. Have the student remove the distributor cap and the rotor on a variety of distributor types. 2. Have the student identify the primary, condenser, and grounding leads on a variety of distributor types. 3. Have the student practice removal of the contact set and condenser of a variety of distributor types. 4. Use PT 3.

Evaluation	Tools, Equipment and Supplies
1. Teacher evaluation. 2. Score and critique the student's evaluation of the condition of the contact sets. 3. Check that the distributor caps are properly seated to the keying device on the distributor and that the latching mechanisms are properly engaged.	1. Screwdriver 2. Droplight
1a. Check that the student can locate and identify the distributor and the ignition coil and trace the high voltage lead connecting them. 1b. Check that the jumper wire makes electrical contact with the high voltage lead and that the other end of the jumper wire is connected to a grounded part of the engine. 2. Have the student troubleshoot a spare distributor with known primary circuit defects.	1. Tune-up Tester (with dwell meter and points functions) 2. Jumper wire
1. Ask the students to identify the application by make or manufacturer or a variety of distributors, rotors, and contact sets which have distinguishing features. 2. Have the student identify the proper tool to use to loosen the electrical leads on a variety of contact sets. 3a. Check for use of the proper size screwdriver and deformation of the screw slots during contact set removal. 3b. Check the distributor plate for the presence of loose screws, washers and other debris on and around the distributor plate.	1. Screw driver 2. Ignition wrenches

Unit of Instruction	Student Objectives	Suggested Learning Activities
Install the Contact Set and Condenser	Given a contact set, condenser and a distributor, the student will be able: 1. to lubricate the distributor cam. 2. to install the contact set and condenser. 3. to set the point gap with a feeler gauge. 4. to electrically connect the primary and the condenser lead to the contact set mounting post.	1. Demonstrate cleaning and relubrication of the distributor cam surface. 2. Have the student draw the distributor plate for his distributor and show placement of components. 3. Demonstrate and have the students practice setting the point gap on a series of bench distributors. 4. Have the students electrically connect a number of bench distributors having a variety of mounting posts and lead arrangements. 5. Use PT 4.
Dwell Test and Adjustment, Cranking	Given a distributor with contact set in place, the student will be able: 1. to get the dwell angle setting limits from the meter manual for his motor. 2. to ground the high voltage lead to the motor. 3. to use the dwell meter to set the dwell angle to a value within the tolerance limits. 4. to return the motor to running configuration.	1. Demonstrate the use of the motor manual by "finding" the dwell angle limits for a specific motor. 2. Demonstrate the proper grounding technique with a jumper wire. 3. Demonstrate the reading of the meter and adjustment of the points to a value within the dwell angle limits. 4. Demonstrate replacement of the distributor rotor, distributor cap and high voltage wire. 5. Use PT 5.
Dwell Test and Adjustment, Idling	Given an engine in running condition, the student will be able: 1. to get the upper and lower dwell angle limits from the motor manual. 2. to use the dwell meter to read and adjust the dwell angle setting of the distributor.	1. Demonstrate the use of the motor manual by "finding" the dwell angle limits for a specific motor. 2. Demonstrate by reading the dwell angle setting on a number of operating engines in the shop and adjust to within limits as necessary. 3. Use PT 6.

Evaluation	Tools, Equipment and Supplies
1. Check for thin layer of lubricant evenly distributed around the cam surface. 2. Check for correct installation by the student of contact sets and condensers on a variety of bench distributors. 3. Confirm the student's point gap setting by measuring with a feeler gauge. 4. Check connections for security and leads for proper routing.	1. Cam lubricant 2. Screwdriver 3. Motor manual 4. Ignition wrenches
1. Have the student find the dwell angle limits for a number of common motors and check his results. 2. Check that the student grounds the high voltage lead to a metal part of the motor and not to an insulator or ungrounded part of the engine. 3. Check the student's dwell setting to tolerance on a job in the shop. 4. Check that the distributor components and wires have been properly installed and that loose equipment and tools have been removed from the engine compartment.	1. Motor manual 2. Screwdriver 3. Dwell tachometer 4. Jumper wire 5. Allen wrench
1. Have the student find the dwell angle limits for a number of common motors and check his results. 2. Have the student set the dwell angle of a shop engine and verify that it measures within proper limits.	1. Dwell meter 2. Screwdriver 3. Allen wrench

Unit of Instruction	Student Objectives	Suggested Learning Activities
Setting the Ignition Timing	Given an operable engine, the student will be able: 1. to find the proper timing setting from the motor manual. 2. to prepare the engine for the timing setting. 3. to disconnect and plug the distributor vacuum hoses as required. 4. to set the distributor timing within +1 degree of specification. 5. to make a quick check of the centrifugal advance mechanism. 6. to make a quick check of the vacuum advance mechanism.	1. Show the student how to locate and apply the information on distributor timing, timing marks, and number one cylinder location. 2. Have the student paint the index pointer and the proper timing mark on his motor with a fine white line. 3. Demonstrate how vacuum advance will prevent accurate setting of the distributor timing. 4. Demonstrate the setting of the distributor angle on a common make of automobile. 5. Demonstrate the advance in timing when motor speed is increased. 6. Demonstrate the advance in timing when the vacuum hose is connected at fast idle. 7. Use PT 7.

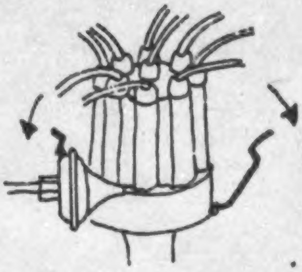
Evaluation	Tools, Equipment and Supplies
1. Have the student copy the information for setting the timing of his engine. Check the accuracy and completeness of his information. 2. Check that the student has "read" and marked his timing angle correctly for his engine. 3. Check that the student disconnects and plugs the vacuum hoses as required. 4. Check the accuracy of the student's distributor angle setting on a job. 5. Observe the student while he is performing this test.	1. Timing light 2. Golf tees or pencils 3. White paint or chalk 4. Distributor wrench

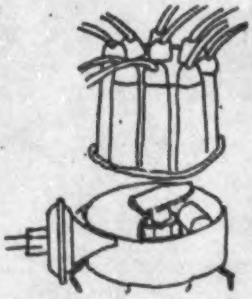
Visual Test of the Ignition Points (Ford)

GET: Tools:
1. screwdriver
References:
1. Activity Card SP 6 (Remove the Air Cleaner Shell)
2. Activity Card SP 8.(Replace the Air Cleaner Shell)
Equipment:
1. droplight

DO: 1, Remove the aircleaner shell. (Do Activity Card SP 6).

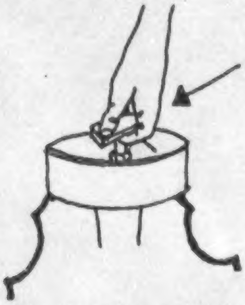
2. Free the two latches from the sides of the distributor cap by prying out with a screwdriver.

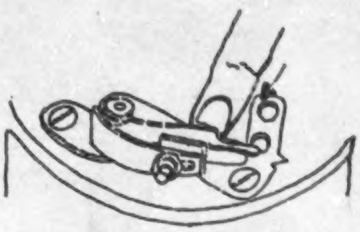




3. Remove the distributor cap, with the wires attached, from the top of the distributor with your fingers.

4. Remove the distributor rotor by lifting upward with your fingers.

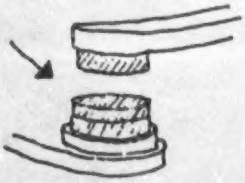


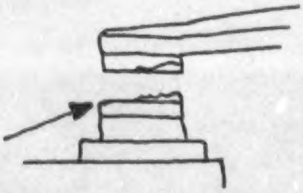


5. Spread the contact points with your finger tips.

6. Look at the color and smoothness of the contact point surfaces.

7. If the contact points are burned blue or black in color, remove the contact set and condenser. (Do Activity Card PT 3).





Visual Test of the Ignition Points (Ford)
(CONTINUED)

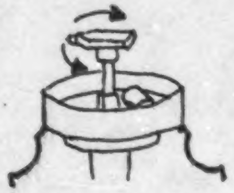
8. If the contact points are pitted or have ridges higher than .002", remove the contact set and condenser. (Do Activity Card PT 3).

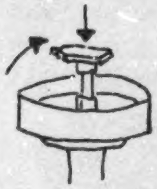
9. If the contacts point surfaces are smooth and shiny or a dull gray color, they are okay.

10. Do the resistance test of the ignition points. (Do Activity Card PT 2).

11. Place the rotor on the end of the distributor shaft.

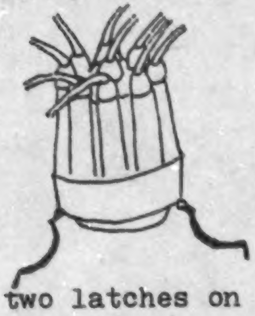
12. Turn the rotor on the end of the distributor shaft until it drops into place.

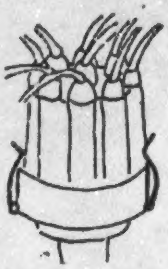




13. Check the position of the rotor by pressing down firmly and turning the rotor until it hits a stop.

14. Place the distributor cap on the distributor and rotate back and forth gently until the cap drops into place.





15. Fasten the two latches on the sides of the distributor.

16. Replace the air cleaner shell. (Do Activity Card SP·8).

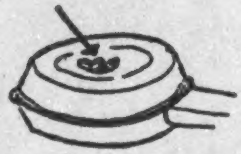
NOW: 1. Check that all of the high voltage wires are pressed firmly down into the distributor cap towers.

NEXT: Do Activity Card PT 6. (Dwell Test and Adjustment, Idling)

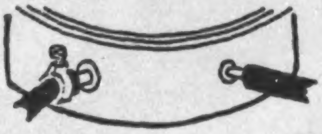
Remove the Air Cleaner

GET: Tools
1. screwdriver

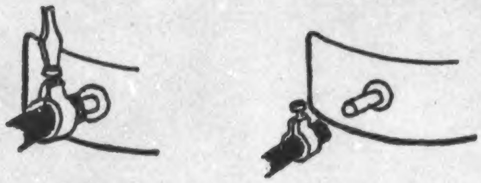
DO: 1. Remove the wing nut from the top of the air cleaner.



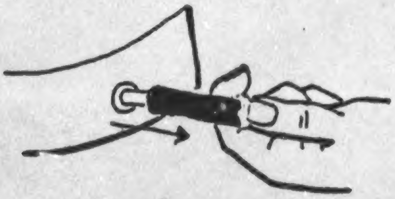
2. In order to remove the air cleaner, you must disconnect all of the tubes and hoses from the air cleaner. Some of these have clamps on them and some do not have clamps. Find those hoses with clamps and those without clamps.



3. If the hose has a clamp, loosen the clamp with a screwdriver. Note: Leave the clamps in place on the hoses.

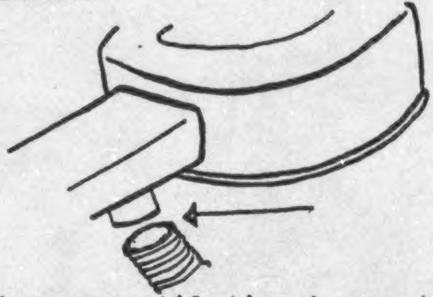


4. If the hose does not have a clamp, you can remove it by pulling down on the hose. Hold the hose at the point where it joins the air cleaner.

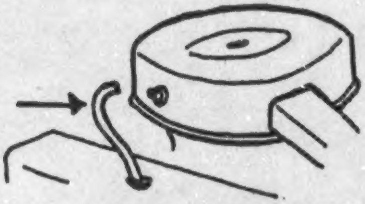


Remove the Air Cleaner
(CONTINUED)

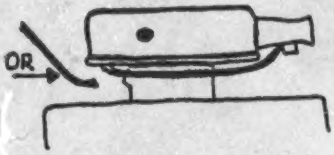
5. Disconnect the hot air tube at the air cleaner.
   Note: Remember or mark the connection point for each hose on the air cleaner.



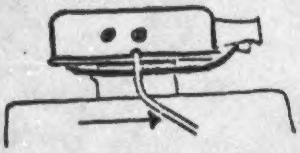
6. Disconnect the crankcase ventilation hose at the side of the air cleaner.



7. Disconnect the hot air modulator vacuum hose at the air cleaner.



8. Disconnect the fuel tank vapor hose at the air cleaner.



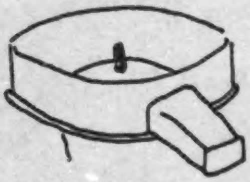
9. Lift the air cleaner shell from the engine.

NOW: 1. Check to see that you know where all the hoses connect.

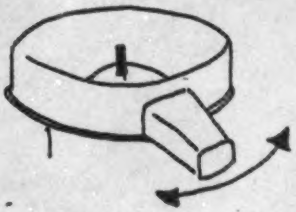
Replace the Air Cleaner

GET: 1. bottom and top of
        air cleaner
     2. wing nut
     3. air filter

DO: 1. Place the bottom part of the air cleaner on the carburetor.

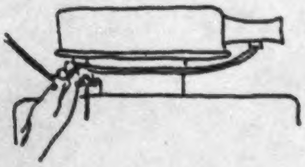


2. Rotate the air cleaner back and forth until you feel it lock into place.

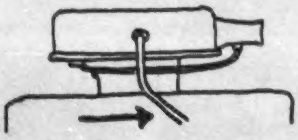


3. Connect all of the hoses to the air cleaner. If the hoses have clamps, tighten the clamps with a screwdriver.

4. Push the hot air modulator vacuum hose onto the air cleaner.

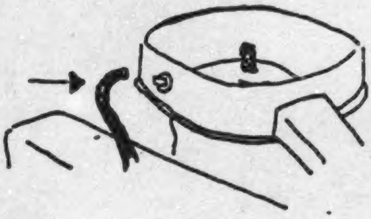


5. Push the fuel tank vapor cannister hose onto the air cleaner connection.

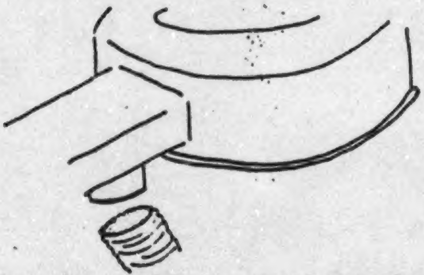


Replace the Air Cleaner
(CONTINUED)

6. Push the end of the crankcase ventilation hose onto the crankcase filter nipple.

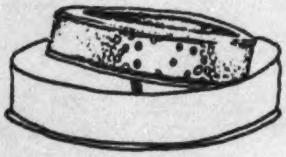


7. Push the end of the hot air tube onto the air cleaner.

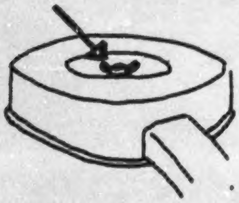


8. Check to make sure that all hoses have been attached tightly to the air cleaner. Also, be sure that all clamps have been tightened.

9. Put the air filter in the air cleaner.



10. Put the top on the air cleaner and tighten the wing nut finger tight.



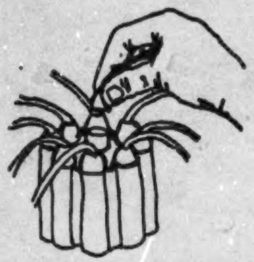
NOW: 1. Check that all hoses are in the right place. Check that the air cleaner will not rotate.

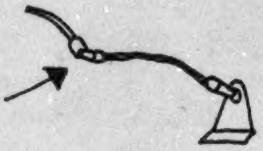
Resistance Test of the Ignition Points

GET: Equipment:
1. tune-up tester
2. jumper wire

Reference:
1. Activity Card PT 3. (Remove the Ignition Contact Set and Condenser)

DO: 1. Remove the high voltage lead from the center tower of the distributor cap.



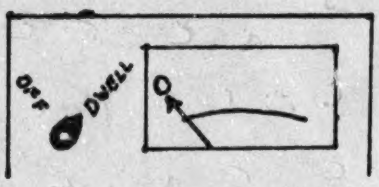


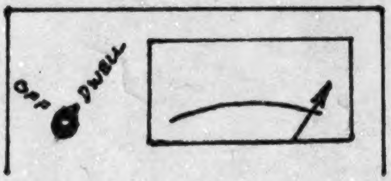
2. Ground this lead by connecting it to the engine with a jumper wire.
Warning: You may receive a severe electrical shock if you do not ground the high voltage lead.

3. Connect the dwell tachometer. Ask your instructor if you need help.

4. Turn the dwell tachometer selector knob to "Dwell."

5. If the meter reads zero, use the ignition key or the remote starter switch to jog the starter until the meter reads full scale (needle to the right side of the meter). Leave the ignition switch "ON."

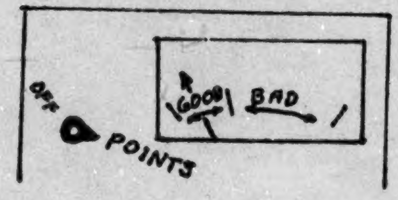


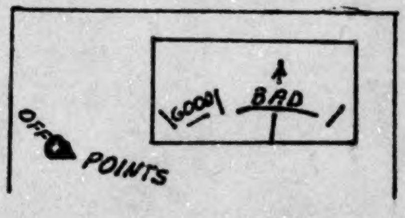


6. If the meter reads full scale, turn the selector switch to "Points."

Resistance Test of the Ignition Points
(CONTINUED)

7. Read the points scale to see if the needle reads "good."

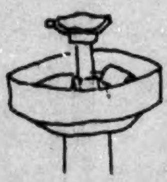


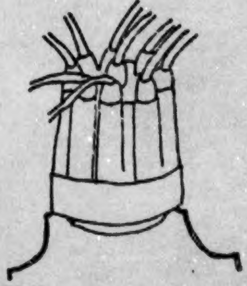


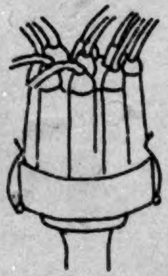
8. If the needle does not read "good," remove the ignition contact set and condenser now. (Do Activity Card PT 3).

9. If the needle reads good, the points and condenser are okay. Turn the ignition switch "OFF."

10. Install the rotor on the end of the distributor shaft.



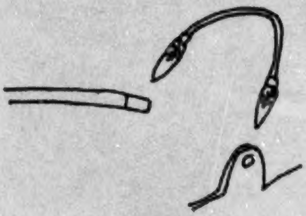


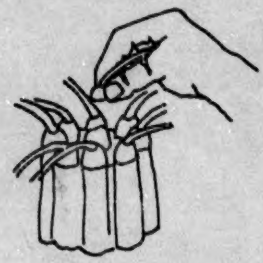


11. Install the distributor cap.

12. Fasten the latches on the sides of the distributor cap.

13. Remove the jumper wire from the engine and from the high voltage wire.

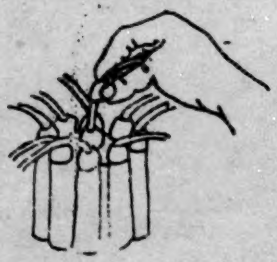




14. Push the end of the high voltage wire firmly into the center tower of the distributor cap.

Resistance Test of the Ignition Points
(CONTINUED)

15. Push the boot down firmly over the center tower of the distributor cap.



NOW: 1. Leave the dwell tachometer in place and check that the compartment is clear and the motor is ready to run.

NEXT: Do Activity Card PT 6. (Dwell Test and Adjustment, Idling)

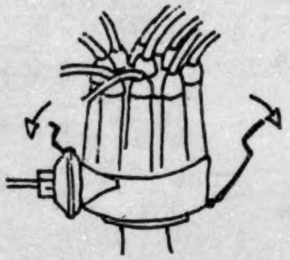
Remove Ignition Contact Set and Condenser (Ford)

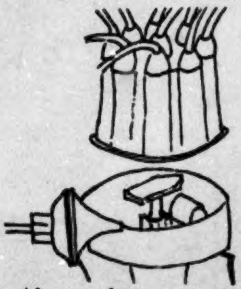
GET: Tools:
1. screwdriver
2. ignition wrench

References:
1. Activity Card SP 6. (Remove the Air Cleaner Shell)

DO: 1. Remove the air cleaner shell. (Do Activity Card SP 6).

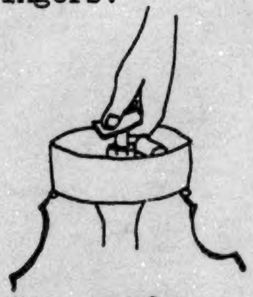
2. Free the two latches on the sides of the distributor cap by pressing outward with your fingers or with a screwdriver.

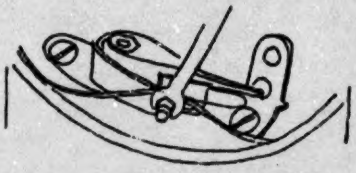




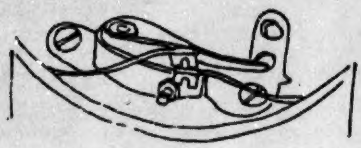
3. Lift the distributor cap, with the wires attached, from the top of the distributor with your fingers.

4. Lift the rotor from the top of the distributor shaft with your fingers.





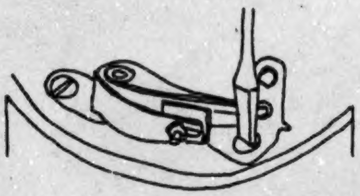
5. Loosen the mounting post nut on the side of the contact set with an ignition wrench.



6. Remove the two wires from the contact set.

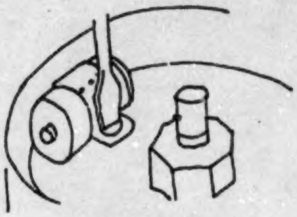
Remove Ignition Contact Set and Condenser (Ford)
(CONTINUED)

7. Remove the two screws holding the contact set with a screwdriver.

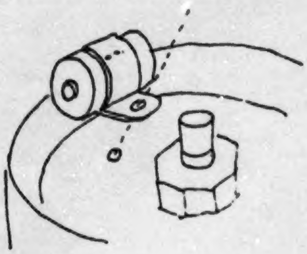


8. Remove the contact set from the distributor plate.
   Note: Remember the position of the contact set on the distributor plate.

9. Remove the screw holding the condenser with a screwdriver.



10. Remove the condenser from the distributor plate.
    Note: Remember the position of the condenser on the distributor plate.



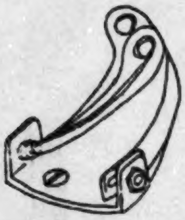
NOW: 1. Check the distributor plate for loose screws and dropped hardware.

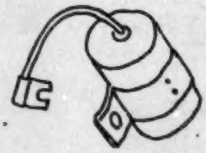
NEXT: Install the contact set and condenser. (Do Activity Card PT 4)

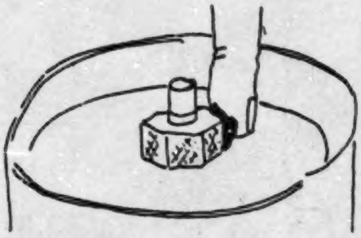
Install the Contact Set and Condenser (Ford)

GET: Tools:
1. screwdriver
2. ignition wrench
3. feeler gauge
Reference:
1. engine manual

DO: 1. Get a new contact set and condenser for your motor.

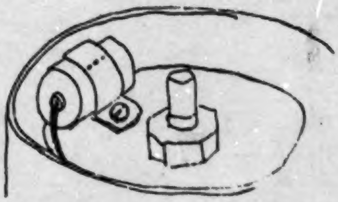






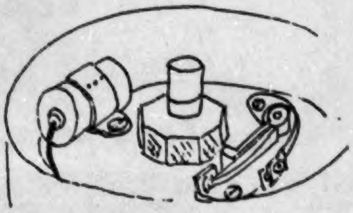
2. Place a small amount of cam grease on your fingertip and rub it around the distributor cam surface.
Warning: Excessive amounts of grease on the cam surface may fly off and cause failure of the contact points.

3. Place the new condenser in position on the distributor plate.



4. Install and tighten the screw for the condenser.

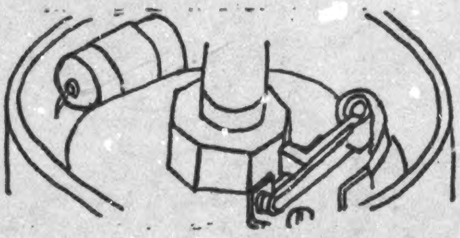
5. Place the contact set in position on the distributor plate.



Install the Contact Set and Condenser (Ford)
(CONTINUED)

6. Install but do not tighten the two screws for the contact set.

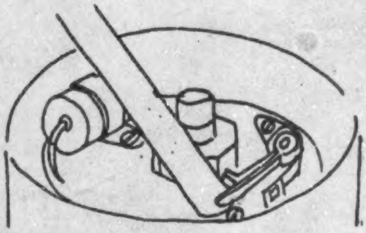
7. "Bump" the engine with the starter until the rubbing block on the contact set is on top of one of the lobes of the distributor cam.



8. Get the contact point setting from the engine manual or owner's handbook.

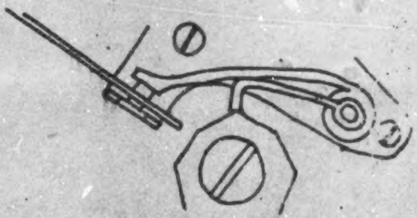
(Check with your teacher to see that you are right.)

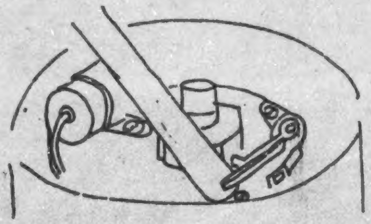
9. Find the proper blade for the point setting on a set of feeler gauges.



10. Pry open the contact points with your fingers and drop the blade of the feeler gauge in between the open points.

11. Push the contact set toward the distributor cam until the rubbing block is firmly against the cam lobe.



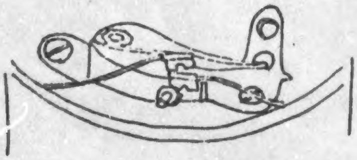


Install the Contact Set and Condenser (Ford)
(CONTINUED)

12. Tighten both screws on the contact set.

13. Pry open the contacts with your fingers and lift the blade of the feeler gauge from between the contacts.

14. Attach the condenser lead to the mounting post on the contact set but do not tighten.



15. Attach the primary lead to the mounting post on the contact set and tighten the nut with an ignition wrench.

NOW: 1. Check that the condenser lead and the primary lead do not touch the contact set except at the mounting post.

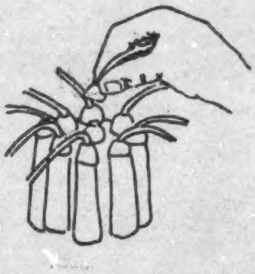
NEXT: Do Activity Card PT 5. (Dwell Test and Adjustment, Cranking)

Dwell Test and Adjustment, Cranking (Ford)

GET: Reference:
1. engine manual
Tools:
1. screwdriver
Equipment:
1. dwell tachometer

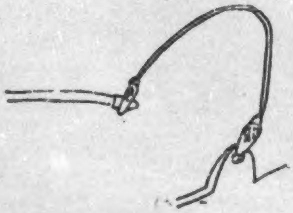
DO: 1. Get the high and low dwell angle settings from the engine manual.

(Be sure you have the right engine.)



2. Remove the high voltage lead from the center tower of the distributor.

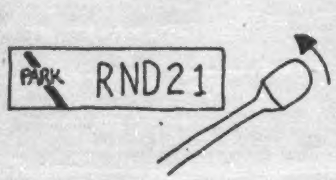
3. Ground this lead by connecting it to a metal part of the engine with a jumper wire.



4. Connect the dwell tachometer. If you need help, ask your teacher.

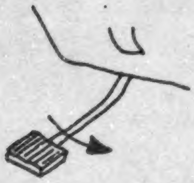
5. Set the dwell tachometer selector knob to "DWELL."

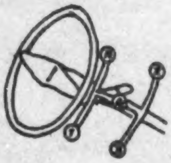
6. Put an automatic transmission in park.



Dwell Test and Adjustment, Cranking (Ford)
(CONTINUED)

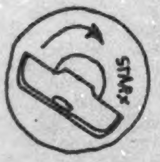
7. Put a manual transmission in neutral



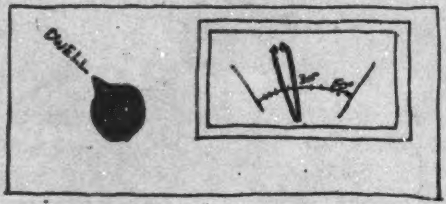


8. Set the parking brake.

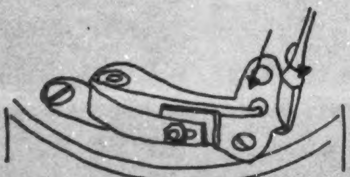
9. Use the ignition key or the remote starter switch to crank the engine 5 or 6 revolutions.
Note: The engine will crank but will not start.

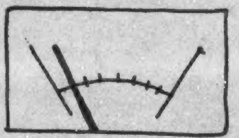


10. Read the middle position of the needle on the dwell scale while the engine is cranking.
Note: The needle will move slightly during cranking.



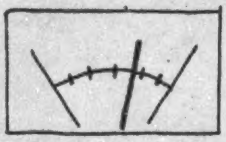
11. If the dwell reading is below the low dwell angle setting from the motor manual, the contact point gap is too large. Use a screwdriver to slightly loosen the screws on the contact set and move it slightly away from the distributor cam. Retighten the screws.

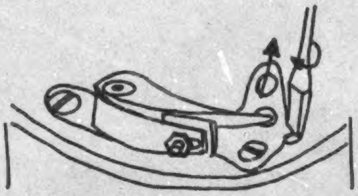




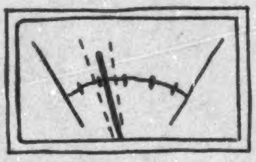
Dwell Test and Adjustment, Cranking (Ford)
(CONTINUED)

12. If the dwell reading is above the high dwell angle setting from the motor manual, the contact point gap is too small. Use a screwdriver to loosen the screws on the contact set and move the contact set slightly toward the distributor cam. Retighten the screws.



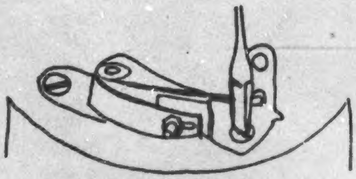


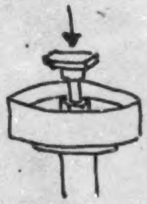
13. Repeat steps 9 through 13 until the dwell meter has a reading between the high and the low dwell angle settings from the engine manual.



14. If the dwell meter reading is between the high value and the low value from the motor manual, the dwell setting is correct.

15. Tighten the screw on the contact set.



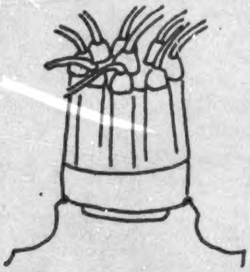


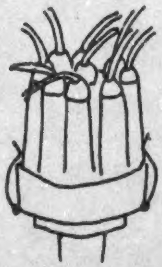
16. Push the distributor rotor firmly onto the end of the distributor shaft.

17. Turn and push down firmly on the rotor until it drops into place on the distributor shaft.

Dwell Test and Adjustment, Cranking (Ford)
(CONTINUED)

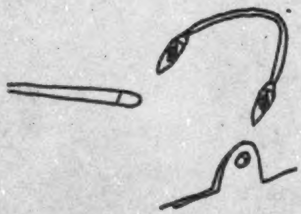
18. Place the distributor cap on the top of the distributor.

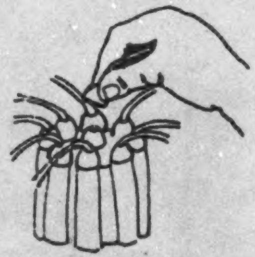




19. Fasten the two latches on the sides of the distributor.

20. Remove the jumper wire from the high voltage wire and the engine.





21. Push the high voltage wire down into the center tower of the distributor.

22. Push the boot down over the center tower of the distributor.

23. Start the engine and run until it has warmed up.

NOW: 1. Be aware that when you set the dwell angle, you changed the engine timing.

NEXT: Do Activity Card PT 6. (Dwell Test and Adjustment, Idling)

Dwell Test and Adjustment, Idling (Ford)

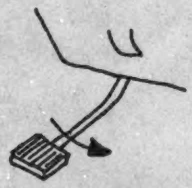
GET: Reference:
1. engine manual

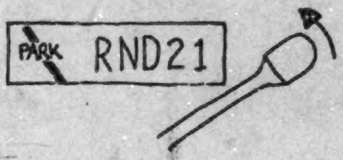
DO: 1. Get the high and low dwell angle settings for your engine from the engine manual.

(Make sure you have the right car and engine.)

2. Connect the dwell tachometer. If you need help, ask your teacher.

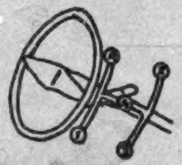
3. Set the parking brake.

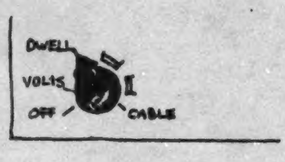




4. Put an automatic transmission in park.

5. Put a manual transmission in neutral.





6. Set the dwell tachometer selector knob to "dwell."

7. Start the engine and run at idle RPM.

Dwell Test and Adjustment, Idling (Ford)
(CONTINUED)

8. Read the dwell from the meter scale.
   Note: Check that you are reading the correct scale for your 6 or 8 cylinder car.

(Be sure you have the right engine.)

9. If the dwell meter reading is below the low dwell angle setting from your engine manual, shut off the motor and do Activity Card PT 5. (Dwell Test and Adjustment, Cranking).

10. If the dwell meter reading is above the high dwell angle setting from your engine manual, shut off the motor and do Activity Card PT 5. (Dwell Test and Adjustment, Cranking).

(Check to make sure you are on the right page.)

11. If the dwell meter reading is between the low dwell angle setting and the high dwell angle setting from your engine manual, the dwell setting is okay.

12. Remove the dwell tachometer. If you need help, ask your teacher.

NOW: 1. If you cannot get the dwell setting okay, see your instructor.

NEXT: Do Activity Card PT 7. (Set the Motor Timing)

Setting the Ignition Timing

GET: Equipment:
1. timing light
2. golf tees or pencils

Tools:
1. distributor wrench

Reference:
1. engine manual
2. Activity Card SP 8 (Replace the Air Cleaner Shell)

DO:

1. Shut off the engine.

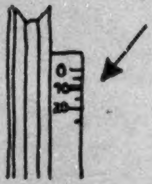
2. Get the timing setting, the timing marks diagram, and the location of number one cylinder from the engine manual for your engine.

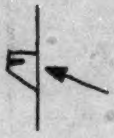
(Check with your teacher to see that you are right.)

3. Use the ignition key or the remote starter switch to jog the starter until the timing marks are visible on the damper pulley.

4. Clean the dirt from the timing marks on the pulley and the index marker.

5. Mark the timing setting from the engine manual on the damper pulley with a fine line of white chalk or paint.



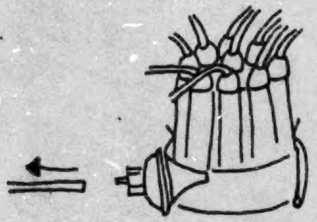


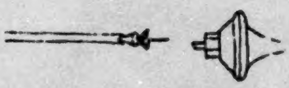
6. Mark the index pointer with a fine line of white chalk or paint.

7. Connect the timing light. If you need help, ask your teacher.

Setting the Ignition Timing
(CONTINUED)

8. Disconnect the two vacuum hoses from the distributor vacuum advance.
   Note: Some distributors have only one vacuum hose.



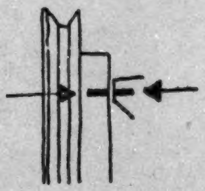


9. Plug the ends of the vacuum hoses with golf tees or pencils.

10. Start the engine and run until it operates at normal idle speed.

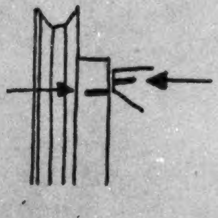
11. Shine the timing lights on the timing marks and index.
    Danger: Keep the timing light and its wires well away from the alternator, fan blades and the motor belts.

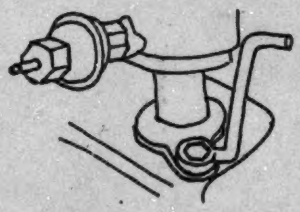
12. Do the white lines line-up exactly?



13. If the white lines line-up exactly, the timing is okay. (Go to Step 19).

14. If the white lines do not line up, loosen the distributor locking bolt with the distributor wrench.





15. Rotate the distributor slightly with both hands.

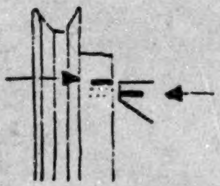
Setting the Ignition Timing
(CONTINUED)

16. Have a helper hold the timing light beam on the timing marks while you rotate the distributor back and forth until the white timing marks are exactly lined up.

17. Tighten the distributor locking bolt with the distributor wrench.

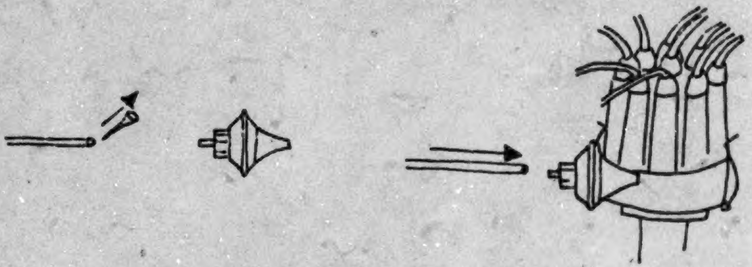
18. Do steps 11, 12, and 13 again.

19. Increase the engine speed slowly and check that the timing mark alignment advances as the engine speed increases.



20. Shut off the engine.

21. Remove the golf tees or pencils from the ends of the vacuum hoses.



22. Connect the vacuum hoses to the distributor vacuum advance connections.

23. Start the engine.

24. Gun the engine and check that there is a rapid advance of the timing marks when the throttle is depressed suddenly.

25. Disconnect the timing light.

26. Replace the air cleaner shell. (Do Activity Card SP 8).

NOW: 1. If you have any problems with the steps, see your instructor.

NEXT: Road test your car and check for idle, acceleration and power.

Appendix 12

JOB TITLE: Engine Tune-Up Specialist

DUTY: Maintain and Repair Ignition System

TASK: Clean, Gap, and Test Spark Plugs

ACTIVITIES:

1. Remove the Spark Plugs
2. Clean the Spark Plugs
3. Preparing to Set the Spark Plug Gap
4. Set the Spark Plug Gap
5. Install the Spark Plugs
6. Remove the Air Cleaner
7. Connect the Spark Plug Leads
8. Replace the Air Cleaner

PREREQUISITE SKILLS AND KNOWLEDGE

This module directs the student to perform numerous tasks. It is assumed that the student has certain basic knowledge and skills that are essential for the successful completion of these activity cards. The prerequisite knowledge and skills are as follows:

1. Use of air hose and accessories
2. Use of mechanic's tool set
3. Use of spark plug condition chart
4. Use of engine manual
5. Use of spark plug cleaner
6. Use of feeler gauge
7. Use of torque wrench

VOCABULARY

The teacher should review these words with the student:

SPARK PLUG

SPARK PLUG SOCKET

SPARK PLUG BOOT PULLER

AIR BLOW GUN

SPARK PLUG RACK

CLOCKWISE (CW)

COUNTER CLOCKWISE (CCW)

CARBON

CERAMIC

CENTER ELECTRODE

GROUND ELECTRODE

ALIGNMENT

SPARK PLUG GAP

GAUGE WIRE

TORQUE

SEATED

AIR CLEANER

WING NUT

HOT AIR TUBE

CRANKCASE VENTILATION

MODULATOR

DISTRIBUTOR CAP

DISTRIBUTOR TOWERS

ROTOR

FIRING ORDER

NIPPLE

FINGER TIGHT

FOOT POUNDS

INCH POUNDS

A CURRICULUM GUIDE FOR

Clean, Gap, and Test Spark Plugs

Unit Of Instruction	Student Objectives	Suggested Learning Activities
Remove the Spark Plugs	Given an automobile engine, the student will be able:	
	1. to remove all spark plugs.	1. Show the student how to make a spark plug rack from a piece of scrap wood with holes drilled and numbered corresponding to the relative location of the cylinders in his engine.
	2. to account for all spark plugs removed by placing them in the proper position in a spark plug rack.	2. Have the student make a spark plug rack for his engine. 3. Use SP 1.
Clean the Spark Plugs	Given a set of uncleaned spark plugs, the student will be able:	
	1. to determine the operating condition of each cylinder by comparing the spark plugs with a spark plug condition chart.	1. Show the student how to identify cylinder condition by examining old spark plugs, both normal and those indicating problems.
	2. to clean spark plugs by removing all combustion residues.	2. Demonstrate the set-up and use of spark plug cleaning machine.
	3. to assemble a complete set of servicable spark plugs.	3. Explain the criteria for a clean and serviceable spark plug. 4. Use SP 2.
Preparing to Set the Spark Plug Gap	Given an engine manual, the student will be able:	
	1. to find proper setting to use when gapping a set of spark plugs.	1. Have the student locate the spark plug gap setting in different manuals and handbooks. 2. Use SP 3.

Evaluation	Tools, Equipment and Supplies
1. Ask the student to locate several cylinders on his engine by number. 2. Show on 8-cylinder engines, how the cylinder number and the firing order are cast into the intake manifold. (1970 and later)	1. engine manual 2. spark plug socket 3. socket extension 4. ratchet 5. spark plug lead puller 6. air hose with blow gun spark plug rack
1. Verify and critique the student's evaluation of the running condition of the cylinders of his engine. 2. Check that the student has assembled a complete set of serviceable spark plugs of the correct number designation for his engine.	1. spark plug conditioner chart 2. air hose 3. spark plug cleaner 4. abrasive
1. Verify the gap setting copied by the student.	1. engine manual

Unit of Instruction	Student Objectives	Suggested Learning Activities
Set the Spark Plug Gap	Given a set of cleaned or new spark plugs, the student will be able:	
	1. to adjust lateral electrode alignment.	1. Show the student how to check and adjust electrode alignment.
	2. to locate the proper gauge wire on the spark plug gauge.	2. Show the student how to gap a spark plug to the proper specification.
	3. to set the spark plugs to the specified gap setting.	3. Show the student the difference in spark plug gap obtained by setting the gap on a plug with a worn electrode by using a leaf gauge and then checking with a gauge wire.
		4. Use SP 4.
Install the Spark Plugs	Given an engine and a set of gapped plugs, the student will be able:	
	1. to determine the specified spark plug torque setting from the engine manual.	1. Have the students find the torque settings for specific engines in the engine manual.
	2. to install and torque spark plugs to a value within the specified torque limits.	2. Demonstrate and then have the students install spark plugs in an old engine head and torque within specification limits.
		3. Use SP 5.
Remove the Air Cleaner	Given an automobile engine, the student will be able:	
	1. to remove the air cleaner shell from the top of an automobile engine.	1. Examine air cleaner installations on several vehicles in the shop area explaining the purpose and connection of pollution control devices to the students.
		2. Use SP 6.

Evaluation	Tools, Equipment and Supplies
1. Spot check a sample of the student's spark plug gap settings on the job.	1. spark plug gauge
1. Observe the student's use and reading of the torque wrench.	1. engine manual 2. torque wrench 3. mechanic's rag 4. oil can
1. Have the student's examine and identify the function of the pollution control hoses on a variety of engines of different makes and models.	

Unit of Instruction	Student Objectives	Suggested Learning Activities
Connect the Spark Plugs	Given a high voltage wiring harness and an engine, the student will be able:	
	1. to determine the location of the number one tower on the distributor cap from the motor manual.	1. Direct the students to determine the location of the number one distributor tower, the firing order and cylinder locations for a number of different engines.
	2. to determine the cylinder firing order from the motor manual or the intake manifold.	
	3. to determine the location of each cylinder from the motor manual or the intake manifold.	
	4. to connect each high voltage wire from the distributor tower to the proper spark plug.	2. Demonstrate and then have the students practice installation of the secondary wiring harness on a shop engine. 3. Explain the need to cross the wires when installing the harness. 4. Use SP 7.
Install the Air Cleaner	Given the air cleaner for an engine, the student will be able:	
	1. to install the air cleaner shell and correctly connect the hoses to the air cleaner.	1a. Demonstrate the proper installation of an air cleaner and the connection of the pollution control hoses. 1b. Guide the class in developing criteria for use or replacement of the air cleaner filter elements. When should you replace the filter elements? 2. Use SP 8.

Evaluation	Tools, Equipment and Supplies
1. Verify the student's location of the number 1 distributor cap tower and direction of rotation of the rotor.	1. engine manual
1. Physically check the air cleaner for security of mounting and correct connection of all pollution control hoses.	1. screwdriver 2. snap ring pliers

Remove Spark Plugs

GET: Hand Tools:
1. spark plug socket
2. extension cord
3. ratchet
4. spark plug boot puller

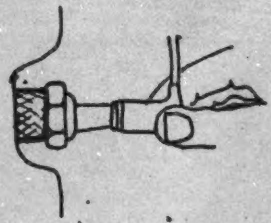
Equipment:
1. air hose
2. air blow gun
3. spark plug rack
4. safety goggles

Supplies:
1. penetrating oil

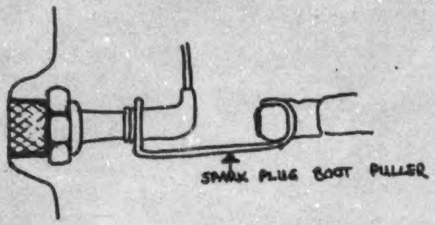
DO:

1. Turn the ignition switch "OFF" and remove the key. Warning: Engine started during work could injure the mechanic.

2. Twist each spark plug boot 1/4 turn to break the seal.



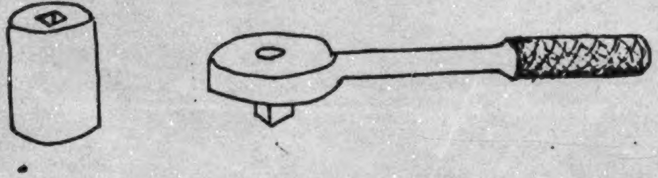
3. Pull each wire off of its spark plug by pulling on the spark plug boot puller.
Caution: Do not jerk or pull on the spark plug wire.



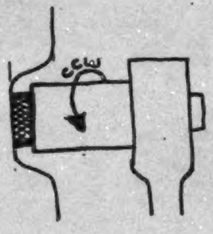
4. If you have an engine with an aluminum head, squirt several drops of penetrating oil such as WD-40 or liquid wrench on the threads at the base of each spark plug.

Remove Spark Plugs
(Continued)

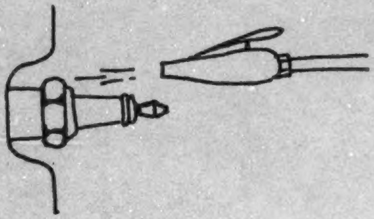
5. To remove the spark plugs, you will need the spark plug socket and ratchet.



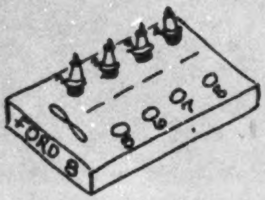
6. Turn each plug 1 turn counterclockwise (CCW) with the spark plug socket and ratchet.



7. Blow dirt out of each spark plug well with a blast from the blow gun. Warning: Wear safety goggles to keep the dirt out of your eyes.



8. Remove each spark plug with the spark plug socket and ratchet and place it in the proper hole of the spark plug rack.



NOW: 1. Have your teacher check your work.

NEXT: Do Activity Card SP 2 (Clean the Spark Plugs).

Clean the Spark Plugs

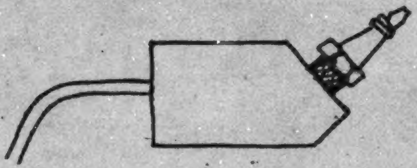
GET: Equipment:
1. spark plug cleaner

Reference:
1. spark plug condition chart
2. motor manual
3. Instruction Card (Operate the Spark Plug Cleaning Machine)

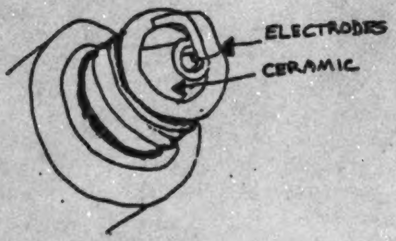
DO:
1. Compare each spark plug with a spark plug condition chart to see the running condition of each cylinder.
   Reminder: Return each spark plug to its proper hole in the spark plug rack when you are finished with it.

2. Show any problem spark plugs to your instructor.

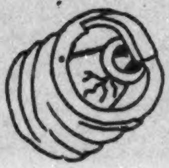
3. Clean each spark plug in a spark plug cleaning machine.



4. Check for complete removal of the carbon from the metal electrodes and the ceramic.

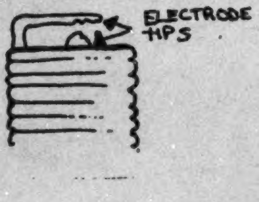


5. Throw away the spark plug if the ceramic is cracked, blistered, or chipped.

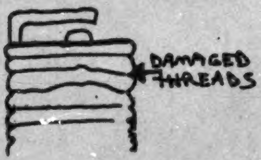


Clean the Spark Plugs
(Continued)

6. Throw away the spark plug if the metal electrode tips are rounded or worn.



7. Throw away the spark plug if the threads are damaged.



8. Check the engine manual or a spark plug chart for the proper spark plug number for your engine.

9. Get enough new spark plugs of the brand and number for your engine to make a complete set.

NOW: 1. Check to see that you have one good spark plug for each cylinder in your engine.

NEXT: Do Activity Card SP 3.

Preparing to Set the Spark Plug Gap

GET: Tools:
1. paper
2. pencil

Reference
1. engine manual

DO:
1. Get the following information on the car on which you are working and write this on a piece of paper.

   Make of car: ______________________________

   Year of car: ______________________________

   Number of cylinders in engine: _____________

   Type of engine: ___________________________

   You will need this information for steps 2 to 5.

2. Get the engine manual. Turn to the page(s) for the correct make of car (for example: Chrysler, Ford, Chevrolet, etc.).
3. Find the correct pages for the make of car that is the same year and has the same number of cylinders as your car.

(Check with your teacher to see that you are right.)

4. Now find the type of engine for the car on which you are working.

   Example: 302 Eng.
   351 Windsor Eng.
   351 Cleveland Eng.
   351 CJ Eng.
   400 Eng. (Electronic Breakless Ignition)

5. Find the column that reads SPARK PLUG GAP. This will tell you the correct spark plug gap for the car on which you are working.
6. Write this on your piece of paper. Spark plug gap: _______
   Note: On modern cars, the spark plug gap setting may be found on the engine data plate.

NEXT: Set the spark plug gap. (Do Activity Card SP 4).

Set the Spark Plug Gap

GET: Tools:

1. spark plug gauge
2. common pliers

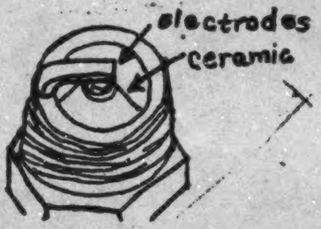
Reference:

1. engine manual

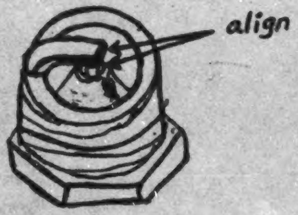
DO:

1. Get a complete set of new or serviceable spark plugs for your engine.

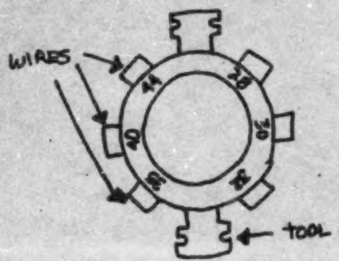
2. Check that the ground electrode and the center electrode are lined up.



3. If the electrodes are not lined up, use a pair of pliers to twist the ground electrode until it is aligned above the center electrode.



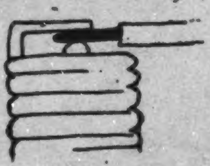
4. Get the spark plug gauge. Notice that there are six wires with numbers next to them and two tools.



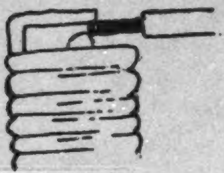
Set the Spark Plug Gap
(Continued)

5. Find the wire that has the same number as the spark plug gap for your car.

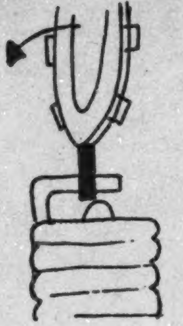
6. Pass the wire through the spark plug electrode gap. The wire should pass through with only a slight drag. If the gap is just right, go to step 13.



7. If the wire will not pass through the gap, it is too small. Go to step 8.

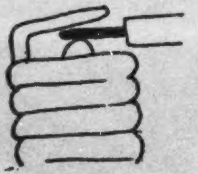


8. Open the gap a little by bending the electrode up very slightly with the tool on the spark plug gauge.



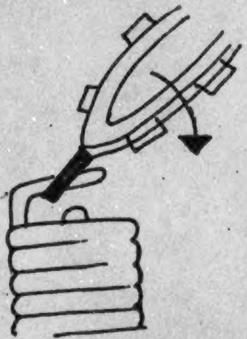
9. Check the gap again as in step 6.

10. If the wire passes through the gap freely with no drag, the gap is too large. Go to step 11.



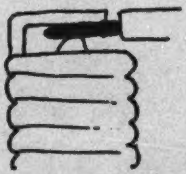
Set the Spark Plug Gap
(Continued)

11. Close the gap a little by bending the electrode down very slightly with the tool on the spark plug gauge.



12. Now check the gap again.

13. If the wire passes through the gap with only a slight drag, the gap is just right.



14. Repeat steps 6 through 13 for each of your spark plugs.

NOW: 1. Check that you have gapped one plug for each cylinder in your engine.

NEXT: Do Activity Card SP 5. (Install the Spark Plugs).

Install the Spark Plugs

GET: Hand Tools:
1. spark plug socket
2. extension
3. ratchet
4. torque wrench

Reference
1. engine manual

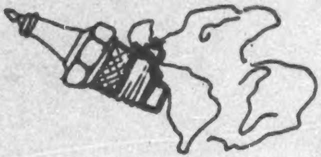
DO: 1. Check spark plug number with the engine manual list for your car.and engine.

(Check to make sure you are on the right page.)

2. Get the spark plug torque setting from the engine manual. You will need this for step 8.

(Check with your teacher to make sure you have the right setting.)

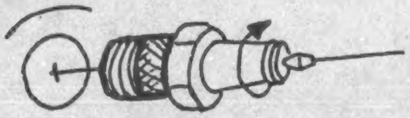
3. Wipe the spark plug threads clean with an oiled mechanic's rag.



4. Find the cylinder.

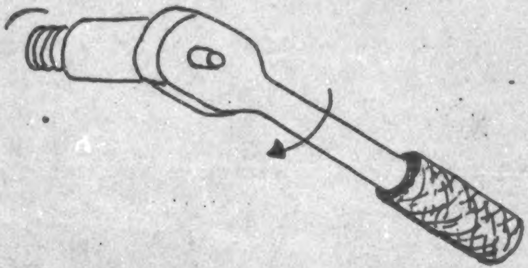
Install the Spark Plugs
(Continued)

5. Line up the spark plug with the hole in the cylinder and start the threads by turning clockwise.

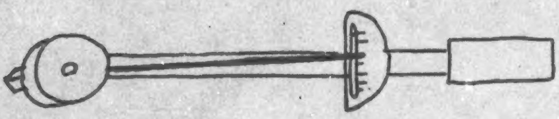


6. Turn the spark plug at least two full turns with your fingers. If the spark plug does not turn easily, take it out and start again.

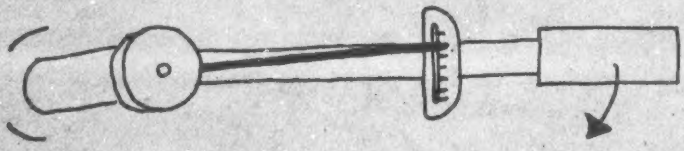
7. Get the spark plug socket and ratchet. Use these to turn the spark plug until it is lightly seated.
Caution: Do not use force when turning the ratchet.



8. Get the torque wrench.



9. Use the spark plug socket and torque wrench to tighten the spark plug to the torque setting from the engine manual. (You found the torque setting in step 2).



Install the Spark Plugs
(Continued)

10. Install the rest of the spark plugs by doing steps 3 through 9.

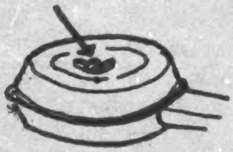
NOW: 1. Check that you have installed a spark plug in each cylinder.

NEXT: Go to Activity Card SP 6 (Remove the Air Cleaner).

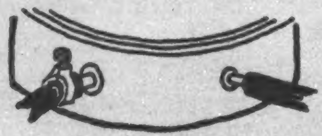
Remove the Air Cleaner

GET: Tools
1. screwdriver

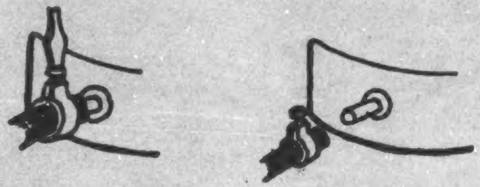
DO: 1. Remove the wing nut from the top of the air cleaner.



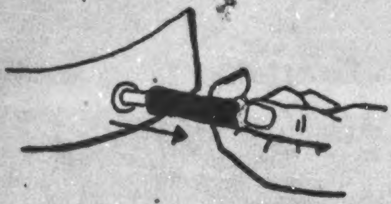
2. In order to remove the air cleaner, you must disconnect all of the tubes and hoses from the air cleaner. Some of these have clamps on them and some do not have clamps. Find those hoses with clamps and those without clamps.



3. If the hose has a clamp, loosen the clamp with a screwdriver. Note: Leave the clamps in place on the hoses.

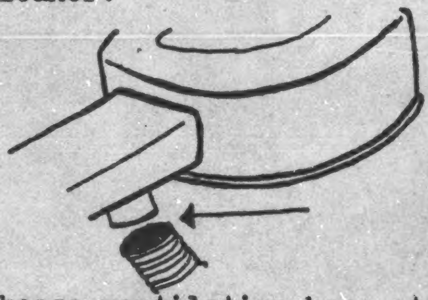


4. If the hose does not have a clamp, you can remove it by pulling down on the hose. Hold the hose at the point where it joins the air cleaner.

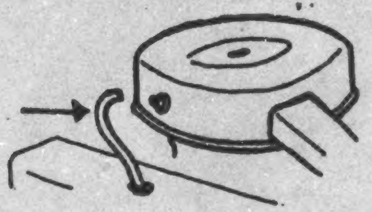


Remove the Air Cleaner
(CONTINUED)

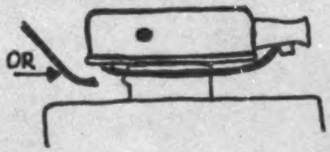
5. Disconnect the hot air tube at the air cleaner.
   Note: Remember or mark the connection point for each hose on the air cleaner.



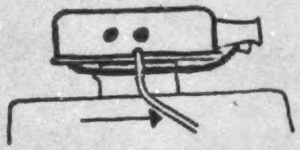
6. Disconnect the crankcase ventilation hose at the side of the air cleaner.



7. Disconnect the hot air modulator vacuum hose at the air cleaner.



8. Disconnect the fuel tank vapor hose at the air cleaner.



9. Lift the air cleaner shell from the engine.

NOW: 1. Check to see that you know where all the hoses connect.

Connect the Spark Plugs

GET: Hand Tools:
1. pliers
References
1. engine manual

DO: 1. Find your engine in the engine manual.

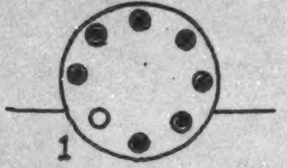
(Make sure you have the right car and engine.)

2. Find the cylinder numbers for your engine in the engine manual.

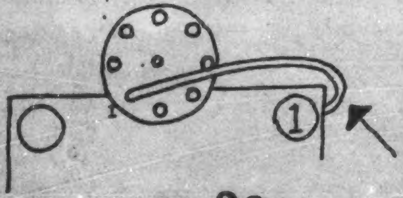
(Check with your teacher to see that you are right.)

3. Mark the number on each cylinder with a piece of chalk.

4. Look in the engine manual and find the location of the number 1 wire on the distributer cap.

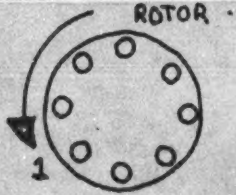


5. Find that wire on your distributer cap and follow along the wire and connect it to the number 1 cylinder spark plug.



Connect the Spark Plugs
(Continued)

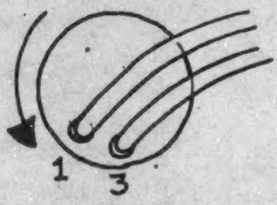
6. Find the direction that the distributer rotor turns from the engine manual.
   Note: Rotor rotation is in the direction away from the vacuum advance.



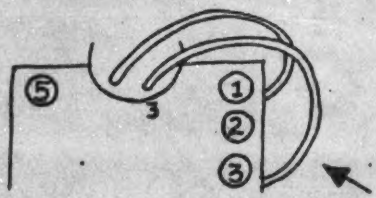
7. Get the engine cylinder firing order from the engine manual or the engine manifold.

(Be sure you have the right engine.)

8. Going around the distributer in the direction that the rotor turns, find the very next wire after the number 1 wire.

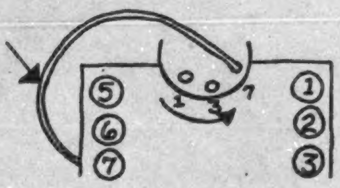


9. Follow along this wire and connect it to the cylinder whose number is the same as the second number in the firing order.



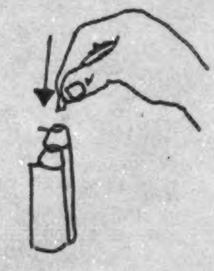
Connect the Spark Plugs
(Continued)

10. Going around the distributer in the direction of rotation, find the next wire. Follow along this wire and connect it to the spark plug of the next cylinder in the firing order.

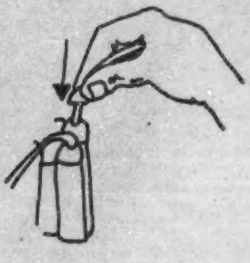


11. Repeat steps 8 through 10 for each of the remaining spark plug wires.

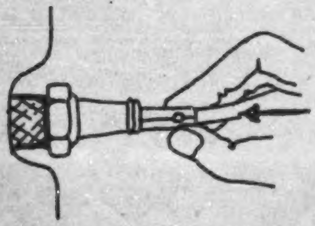
12. Push each of the wires into the distributer towers firmly.



13. Push each of the wire boots down on the distributer towers firmly.

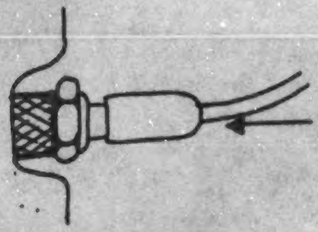


14. Push each of the wires firmly onto the spark plugs.



Connect the Spark Plugs
(Continued)

15. Push each of the spark plug boots firmly onto the spark plug.



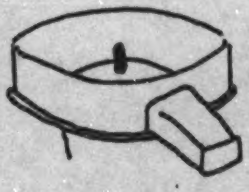
NOW: 1. Check that each spark plug has a high voltage wire connected.

NEXT: Do Activity Card SP 8. (Replace the Air Cleaner)

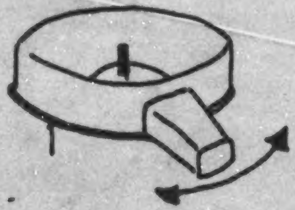
Replace the Air Cleaner

GET:
1. bottom and top of air cleaner
2. wing nut
3. air filter

DO:
1. Place the bottom part of the air cleaner on the carburetor.

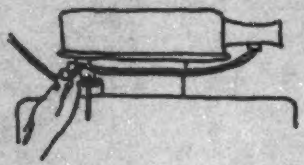


2. Rotate the air cleaner back and forth until you feel it lock into place.

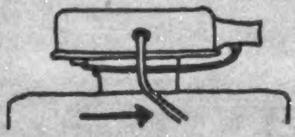


3. Connect all of the hoses to the air cleaner. If the hoses have clamps, tighten the clamps with a screwdriver.

4. Push the hot air modulator vacuum hose onto the air cleaner.

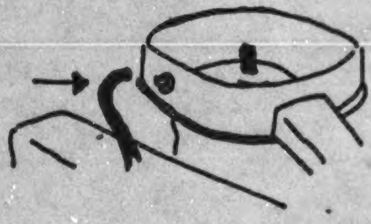


5. Push the fuel tank vapor canister hose onto the air cleaner connection.

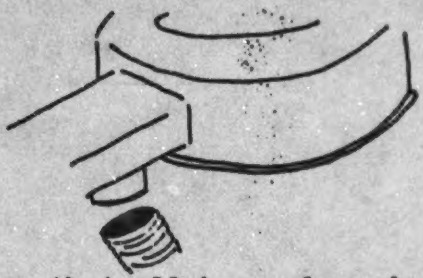


Replace the Air Cleaner
(CONTINUED)

6. Push the end of the crankcase ventilation hose onto the crankcase filter nipple.

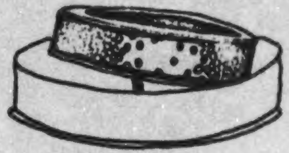


7. Push the end of the hot air tube onto the air cleaner.

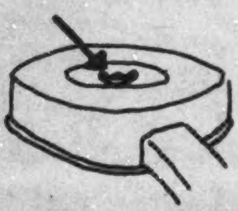


8. Check to make sure that all hoses have been attached tightly to the air cleaner. Also, be sure that all clamps have been tightened.

9. Put the air filter in the air cleaner.



10. Put the top on the air cleaner and tighten the wing nut finger tight.



NOW: 1. Check that all hoses are in the right place. Check that the air cleaner will not rotate.

JOB TITLE: Cooling System Service Person

DUTY: Maintaining and Repairing Cooling Systems

TASK: Check Coolant Freezing Point

ACTIVITIES:

1. Remove the Radiator Cap
2. Check Coolant Quantity and Fill to the Cold Fill Level
3. Check Coolant Freezing Point and Boiling Point

PREREQUISITE SKILLS AND KNOWLEDGE

This module instructs a student throughout the task of checking the coolant freezing point. Certain skills and knowledge are required before attempting the module. A list of prerequisite knowledge follows:

1. Start and bring an automobile to operating temperature in the shop.

VOCABULARY

LATCHES
COOLANT TESTER
BULB
TUBE
VERTICAL
ANTI-FREEZE
RADIATOR
RADIATOR CAP
RADIATOR NECK
RADIATOR CORE

CCW
CW
COLD FILL MARK
OPERATING TEMPERATURE
ANTI-FREEZE TEMPERATURE
ANTI-BOIL TEMPERATURE

A CURRICULUM GUIDE FOR

Check Coolant Freezing Point

Unit Of Instruction	Student Objectives	Suggested Learning Activities
Remove the Radiator Cap	Upon completion of this unit, the student will be able to: 1. open the cooling system.	1. Demonstrate how to cool down a hot engine and safely remove the radiator cap. Warn the students that escaping steam means that the hot water will erupt explosively from the radiator if the cap is removed. 2. Explain that if a floating ball or temperature compensating tester is to be used, the anti-freeze temperature should be measured at this time. 3. Show the student how to hasten the cooling process by spraying water on the radiator core. 4. Use CS1.
Check Coolant Quantity and Fill to the Cold Fill Level	Upon completion of this unit, the student will be able to: 1. service the coolant to the proper level.	1. Show the student how to prepare the proper anti-freeze water mixture for adding to the radiator in your climate zone. 2. Explain that for crossflow radiators the proper cold fill coolant level is about 3 inches below the radiator neck and for vertical flow radiators about 1½ inches below the radiator neck. 3. Use CS2.

Evaluation	Tools, Equipment and Supplies
1. Student is able to open a cooling system without danger to himself or excessive loss of coolant.	1. anti-freeze mix 2. coolant tester 3. large thick rag 4. pencil and paper
2. Check that the student checks the coolant at a temperature that is appropriate for the type of tester that he is using.	
1. Check that the student is able to determine the proper anti-freeze and water proportions to obtain a coolant mixture of a desired freezing point.	

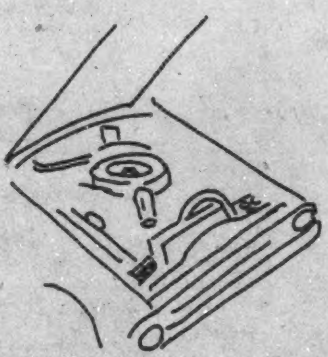
Unit of Instruction	Student Objectives	Suggested Learning Activities
Check Coolant Freezing Point and Boiling Point	Upon completion of this unit, the student will be able to:	
	1. bring the coolant to operating temperature.	1. Show the student how to speed up the warm up process by covering the radiator core.
	2. draw a sample of the engine coolant.	2. Demonstrate how to draw the coolant slowly into the tester and then tap as necessary to free the air bubbles from the float.
	3. read the anti-freeze protection temperature.	3. Have the students measure the anti-freeze temperatures of several prepared solutions and compare readings. Show the student how to hold the coolant tester vertically while reading the temperature.
	4. read the anti-boil protection temperature.	4. Have the students measure the anti-boil temperatures of several prepared solutions and compare readings.
	5. return the automobile to running configuration.	5. Caution the student to check for installation of the radiator cap and explain the problems of overheating and coolant loss if the cap is not properly installed.
		6. Use CS3

Evaluation	Tools, Equipment and Supplies
1. Check that the student warms the engine until the thermostat opens permitting coolant to circulate through the radiator. 2. Check that the student draws an adequate quantity of coolant to support the float and that the coolant is free of bubbles. 3. Check that the student reads the correct anti-freeze protection temperature ±5. 4. Check that the student reads the correct anti-boil protection temperature ±5. 5. Check that the student installs the correct radiator cap and that he tightens it fully CW to the stop.	

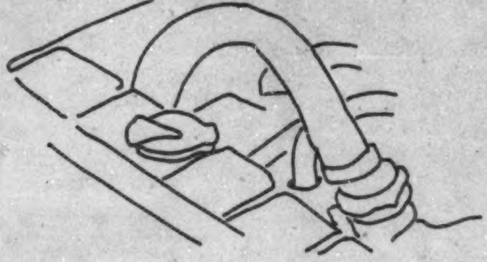
Remove the Radiator Cap

GET: Equipment:
1. large thick rag

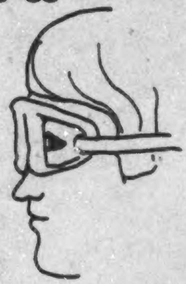
DO: 1. Open the hood of the car.



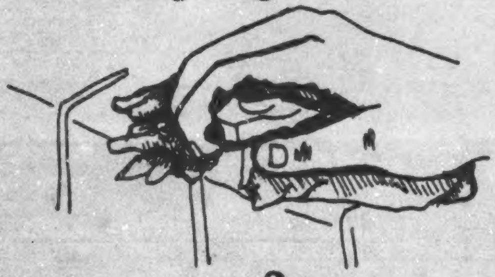
2. Allow the engine to cool until the top of the radiator is cool enough to touch with the hand.
   Caution: Test carefully since the radiator gets hot enough to cause a severe burn.



3. Put on your safety goggles.

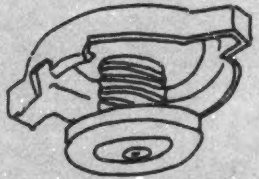


4. Cover the top and sides of the radiator cap with several thicknesses of a large rag.

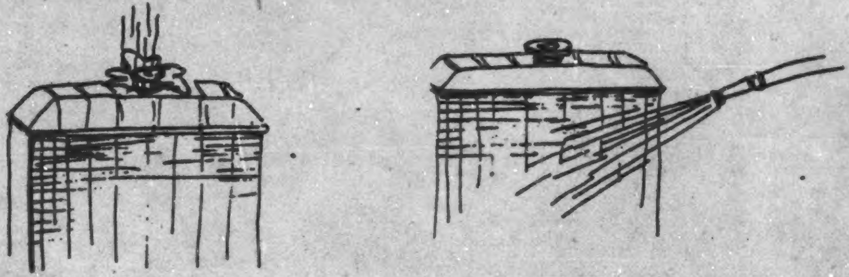


Remove the Radiator Cap
(CONTINUED)

5. Slowly turn the cap CCW to the first notch.
   Caution: If steam escapes from the radiator, tighten the cap immediately by turning CW.

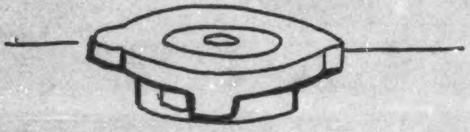


6. If steam escapes, allow the engine to cool more.
   Note: Cooling may be helped by spraying water on the radiator core with a hose.



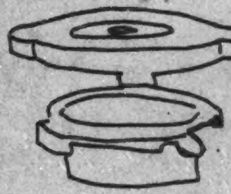
7. Repeat steps 4 through 6 until no steam escapes from the radiator.

8. Press down on the radiator cap and turn CW to the second notch.



Remove the Radiator Cap
(CONTINUED)

9. Lift the radiator cap from the radiator neck.



NOW: 1. Store the radiator cap in a clean place.

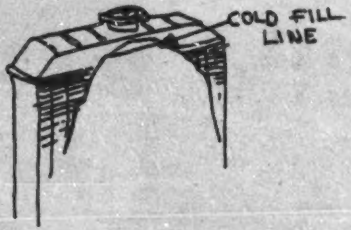
NEXT: Do Activity Card CS 2. (Check Coolant Quantity and Fill Radiator to Cold Fill Level).

Check Coolant Level and Fill Radiator to Cold Fill Level

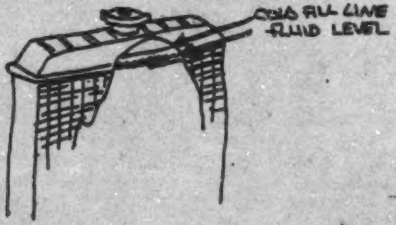
__GET__: Equipment:
1. anti-freeze mix

__DO__: 1. Look on the side of the radiator near the neck and find the cold fill level.

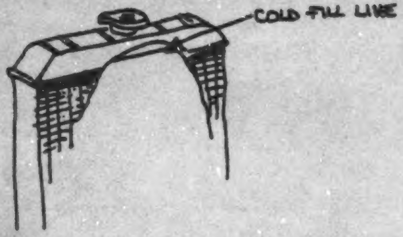
Note: If the radiator does not have a cold fill level mark, ask your instructor how to determine the proper coolant level.


COLD FILL
LINE

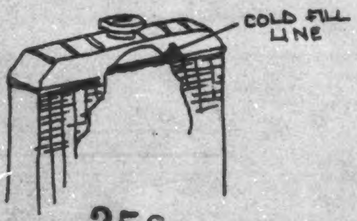
2. Look down into the radiator to see the actual coolant level.


COLD FILL LINE
FLUID LEVEL

3. If the coolant level cannot be seen, check with your instructor to determine the reason for the coolant loss.


COLD FILL LINE

4. If the coolant level is below the cold fill mark, add a mixture of one-half anti-freeze and one-half water until the coolant level reaches the cold fill mark.


COLD FILL
LINE

Check Coolant Level and Fill Radiator to Cold Fill Level
(CONTINUED)

NOW: 1. If you are using a floating ball tester or a hydrometer with a temperature compensation scale, check the coolant freezing temperature and replace the radiator cap at this time. (Follow the manufacturer's instructions).

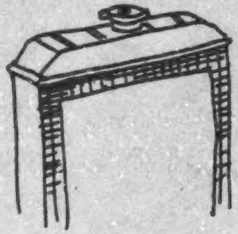
NEXT: Do Activity Card CS 3. (Check Coolant Freezing Point and Boiling Point).

Check Coolant Freezing Point and Boiling Point

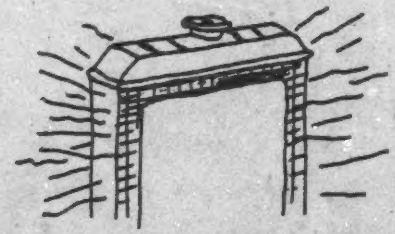
GET: Equipment:
1. coolant tester
2. pencil and paper

DO:

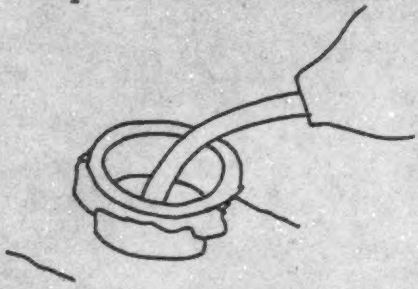
1. With the radiator cap removed, start the engine and run until it reaches operating temperature.
   Note: Warm up time can be shortened by placing a piece of cardboard in front of the radiator core.



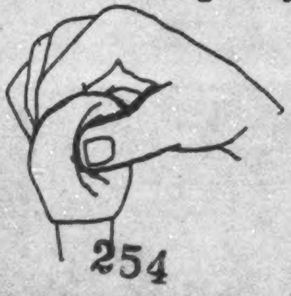
2. When the engine reaches operating temperature, shut off the switch.



3. Insert the tube of the coolant tester into the radiator neck until the tip is in the coolant.

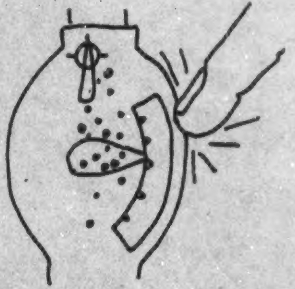


4. Squeeze the bulb and release gently.

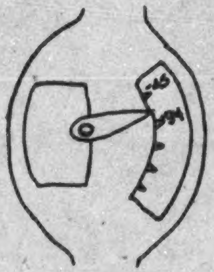


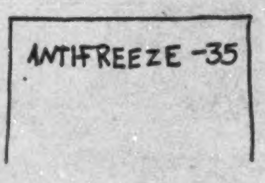
Check Coolant Freezing Point and Boiling Point
(CONTINUED)

5. Tap the coolant tester to free small air bubbles from the float.



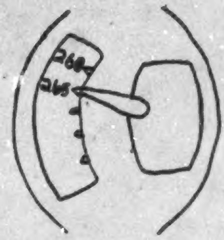
6. Hold the coolant tester vertical and read the anti-freeze temperature from the scale opposite the tip of the pointer.



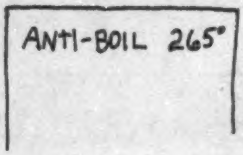

ANTIFREEZE -35

7. Write this anti-freeze temperature on a sheet of paper.

8. Turn the hydrometer around in your hand until you can see the anti-boil temperature scale.



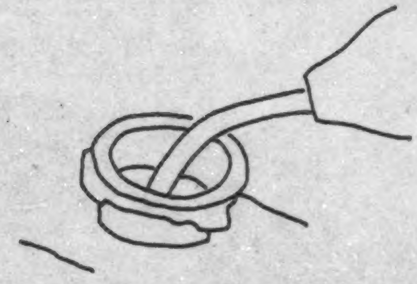
9. Read the anti-boil temperature opposite the tip of the pointer.


ANTI-BOIL 265°

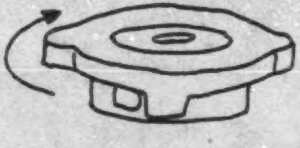
10. Write the anti-boil temperature on the sheet of paper.

Check Coolant Freezing Point and Boiling Point
(CONTINUED)

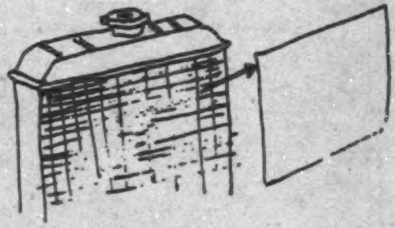
11. Squirt the coolant in the tester back into the radiator.



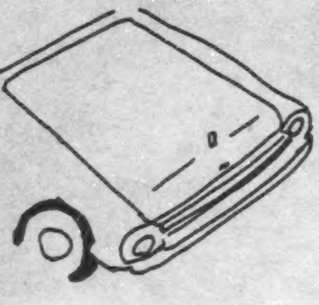
12. Replace the radiator cap by pressing down and turning CW to the stop.



13. Remove any cardboard which you may have placed in front of the radiator core.



14. Close the hood and check that it is latched in the full down position.



NOW: Show your coolant temperature test results to your instructor.

Appendix 14

JOB TITLE: Engine Tune-Up Specialist

DUTY: Routine Maintenance

TASK: Remove and Replace the Air Cleaner Shell

ACTIVITIES:

1. Remove the Air Cleaner Shell
2. Replace the Air Cleaner Shell

PREREQUISITE SKILLS AND KNOWLEDGE

This module directs the student to perform numerous tasks. It is assumed that the student has certain basic knowledge and skills that are essential for the successful completion of these activity cards. The prerequisite knowledge and skills are as follows:

1. Knowledge of right and left hand directions relative to his own body.
2. Knows CCW and CW rotation when applied to removing and tightening a nut.

VOCABULARY

The teacher should review these words with the students:

HOOD
HOOD LOCK
HOOD LOCK RELEASE LEVER
AIR CLEANER SHELL
AIR CLEANER TOP
WING NUT
CARBURETOR
CRANKCASE
CRANKCASE CLOSURE HOSE
VACUUM HOSE
TEMPERATURE SENSOR
VACUUM TEE
EVAPORATIVE EMISSION PURGE HOSE
1/4 TURN
EXHAUST MANIFOLD SHROUD
HOT AIR DUCT
NIPPLE
FINGER TIGHT

A CURRICULUM GUIDE FOR

Remove and Replace the Air Cleaner Shell

Unit Of Instruction	Student Objectives	Suggested Learning Activities
Remove the Air Cleaner Shell	Given an automobile requiring engine service, the student will be able to:	
	1. open the hood by locating and releasing the latch mechanism.	1a. The instructor should demonstrate this operation by unlatching the hood on several types of automobiles with releases in the driver's compartment as well as those with releases at the grill.
		b. Show the operation of the safety or second catch and explain its function.
		c. Show how automobile hoods are supported in the open position by either counterbalance (spring loaded) or propped up with the built-in supporting rods.
	2. unfasten the air cleaner from the carburetor and remove the top.	2a. Identify the wing nut and show its location on a number of air cleaner installations to the students.
		b. Show CCW rotation to remove the wing nut from the carburetor stud.
		c. Show removal of the top of the carburetor.
	3. free the air cleaner shell from the engine by disconnecting all hoses and ducting.	3a. Show the location and explain the function of the hoses and ducts that are connected to the air cleaner shell.
		b. Show removal of the hoses by using a combination twisting and pulling motion.

Evaluation	Tools, Equipment and Supplies
1. Show slides or transparancies of the principal makes of automobiles and have the student specify the location of the latch control.	None Required
2. Check for proper identification of the wing nut and proper CCW rotation to remove the wing nut by the student.	
3. Check that the student follows the steps on his activity card for removal of all hoses and ducts. Ask the student to show each hose and duct connection before removing the air cleaner shell from the carburetor.	

Unit of Instruction	Student Objectives	Suggested Learning Activities
	4. remove the air cleaner shell from the top of the carburetor.	4a. Show how to lift the air cleaner shell vertically to clear the carburetor stud and swing the air cleaner clear of the engine. b. Show safe storage of the air cleaner shell by placing in on the work bench or in the trunk of the automobile. 5. Use Activity Card AC 1.
Replace the Air Cleaner Shell	Given an automobile whose air cleaner shell has been removed, the student will be able to:	
	1. set the air cleaner shell level and at the proper alignment on the carburetor.	1. Demonstrate the proper seating of the air cleaner shell on the carburetor and show rotation to engage the keying index or alignment to properly accomodate the hose connections.
	2. connect all hoses and ducts to the proper connections on the air cleaner shell.	2. Demonstrate the technique of pushing and twisting the hoses onto the connecting nipples. Show the student how to follow the steps of the activity card to sequence the steps and to check his finished work.
	3. place the top on the air cleaner shell and secure the assembly by installing and tightening the wing nut.	3a. Show the necessity of centering the air cleaner filter in the shell before attempting to install the air cleaner top. b. Demonstrate how to fix your vision on the carburetor stud and how to center the hole in the air cleaner top without looking away. c. Demonstrate CW rotation of the wing nut for starting and tightening. d. Demonstrate tightening the wing nut to achieve security of the air cleaner without distorting the air cleaner top.

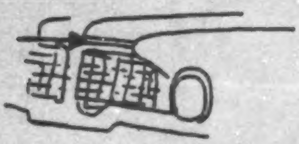
Evaluation	Tools, Equipment and Supplies
4. Check that the student stores the air cleaner in a location where it is safe from damage and is not in the way of the mechanic or free movement about the automobile.	
1. Check that the student has seated the air cleaner shell on the carburetor and rotated to achieve proper alignment.	None Required
2. Check the student's hose and duct connections to verify that the job is complete and correct.	
3a. Check that the air cleaner top seats properly against the top edge of the air cleaner shell.	

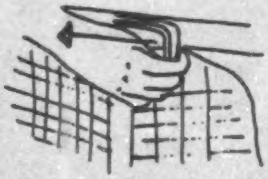
Unit of Instruction	Student Objectives	Suggested Learning Activities
	4. close the hood and check for the security of the latch.	4. Show the student how to pull up on the closed hood to confirm that the primary hood latch is securely engaged. 5. Use Activity Card AC 2.

Evaluation	Tools, Equipment and Supplies
4. Check that the hood is properly latched.	

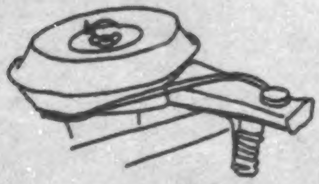
Remove the Air Cleaner Shell
(Ford, Mercury, Lincoln 1970-71)

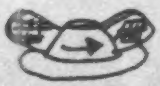
DO: 1. Move the hood lock release lever to the left while raising up on the hood.



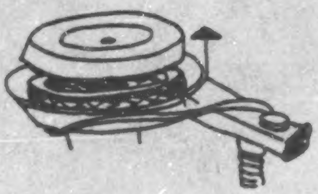


2. Remove the wing nut from the top of the air cleaner by turning counterclockwise with your fingers.

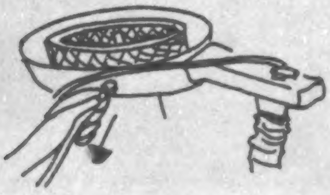




3. Remove the air cleaner top with your fingers and place it on the work bench.

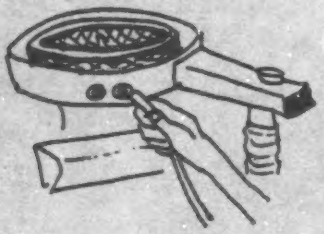


4. Disconnect the crankcase closure hose from the side of the air cleaner by pulling on it with your fingers.

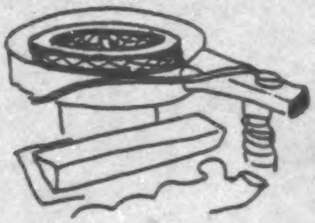


Remove the Air Cleaner Shell
(Ford, Mercury, Lincoln 1970-71)
(Continued)

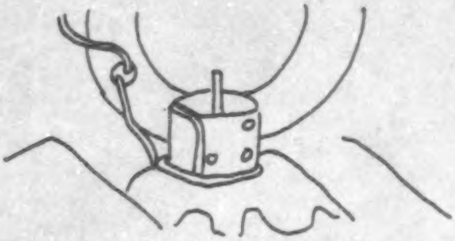
5. Disconnect the evaporative emission purge hose from the side of the air cleaner by twisting it 1/4 turn and pulling on the hose with your fingers.



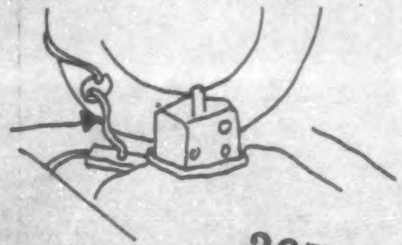
6. Disconnect the hot air duct at the bottom end where it connects to the exhaust manifold shroud by pulling up with your fingers.



7. Tilt the air cleaner shell up and back on the carburetor until you can reach the temperature sensor switch on the bottom half of the air cleaner.

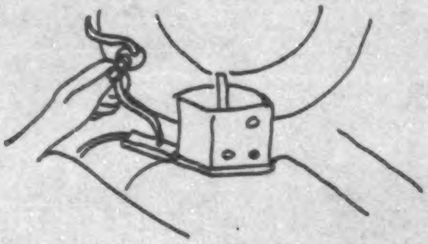


8. Find the vacuum hose that runs from the vacuum tee on the rear of the intake manifold to the temperature sensing switch on the back of the air cleaner shell.

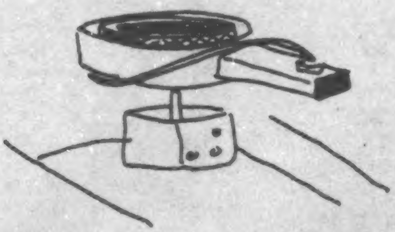


Remove the Air Cleaner Shell
(Ford, Mercury, Lincoln 1970-71)
(Continued)

9. Disconnect this vacuum hose by twisting it 1/4 turn and pulling it off with your fingers.



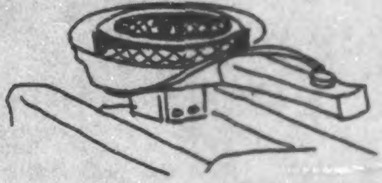
10. Lift the air cleaner shell up and off of the carburetor and put it on the work bench.



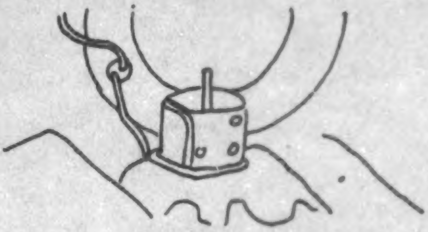
NOW: Check to see that you remember where all of the hoses that you removed were connected.

Replace the Air Cleaner Shell
(Ford, Mercury, Lincoln 1970-71)

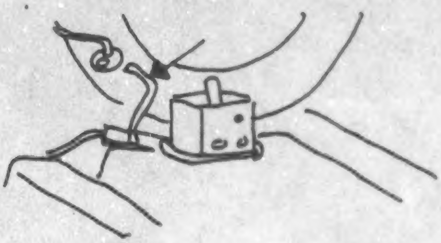
DO: 1. Place the air cleaner shell on the top of the carburetor.



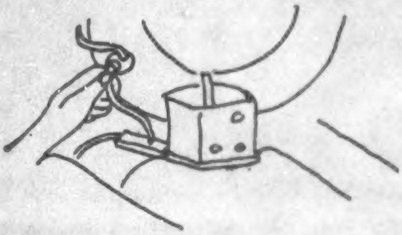
2. Tilt the air cleaner shell up and backward on the carburetor until you can reach the temperature sensor switch on the bottom half of the air cleaner.



3. Find the vacuum hose that runs from the vacuum tee on the rear of the intake manifold to the temperature sensor.

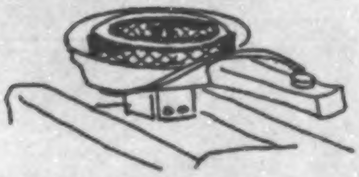


4. Connect this vacuum hose to the temperature sensor switch by sliding it onto the nipple with your fingers.

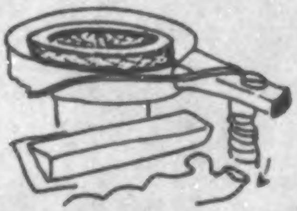


Replace the Air Cleaner Shell
(Ford, Mercury, Lincoln, 1970-71)
(Continued)

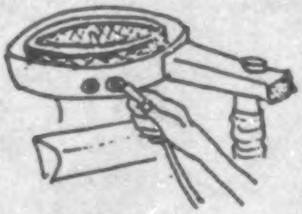
5. Tilt the air cleaner forward until it rests in position on the top of the carburetor.



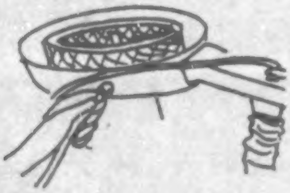
6. Connect the hot air duct at the bottom by pushing it onto the connection on the exhaust manifold shroud with your fingers.



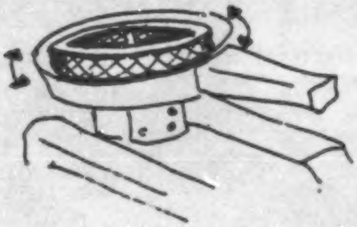
7. Connect the evaporative emission purge hose to the side of the air cleaner by pushing it onto the nipple with your fingers.



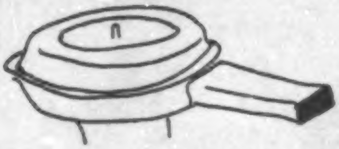
8. Connect the crankcase closure hose to the side of the air cleaner by pushing the plastic elbow onto the nipple with your fingers until the metal clip snaps over flange and holds the elbow in place.



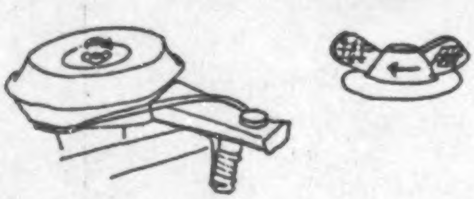
9. Twist the air cleaner shell back and forth on the top of the carburetor with your fingers until you feel it drop into place.



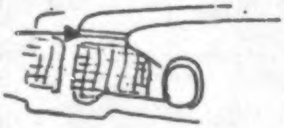
10. Put the top on the air cleaner by centering it over the air cleaner shell and then lowering it so that the stud will pass through the center hole in the air cleaner top.



11. Start the wing nut on the carburetor stud and tighten it finger tight.



12. Close the hood by pushing down on the hood with your hands until the catch locks with the hood in the full down position.



NOW: See your instructor.

JOB TITLES: Gardening
Groundskeeping

DUTY: Maintaining Plants

TASK: Trimming Hedges

ACTIVITIES:

1. Determining why hedges need trimming
2. Determining the shape of a hedge
3. Determining the height
4. Trimming the top of the hedge
5. Trimming the sides of the hedge

PREREQUISITE SKILLS AND KNOWLEDGE

This module will direct and help the student to perform the task of trimming a hedge. While it is precise in its directions, some basic knowledge is essential for successful completion of the unit. A list of prerequisite knowledge and skills follows:

1. use of a yardstick
2. identification of a hedge
3. use of hedge trimmers and rakes
4. knowledge of proper condition of equipment
5. knowledge of vocabulary
6. knowledge of proper pruning angle

VOCABULARY

The teacher should review these words with the students:

DETERMINING
IDENTIFY
HEDGE
REASON
NARROW
PROPERLY
CONDITION
HEDGE TRIMMERS
HEIGHT
WIDTH
PROGRESS

A CURRICULUM GUIDE FOR

Trimming Hedges

Unit Of Instruction	Student Objectives	Suggested Learning Activities
Determining Why Hedges Need Trimming	Given a hedge which needs pruning, the student will be able: 1. to demonstrate knowledge of the reasons for trimming hedges. 2. to cite specific reasons for trimming individual hedges.	1. Discuss with the students the need for hedges to be trimmed. 2. Have students locate poorly trimmed and overgrown hedges. 3. Help students design illustrations of hedges needing trimming. 4. Use Activity Card TH 1. 5. Discuss student answers to the questions on Activity Card TH 1.
Determining the Shape of a Hedge	Given a hedge which needs trimming, the student will be able: 1. to identify the three shapes that a properly pruned hedge can take. 2. to demonstrate knowledge of correcting the shape of improperly trimmed hedges.	1. Have students suggest ways to properly shape the hedges found in the first unit of this guide. 2. Have students illustrate or build mock-ups of the three approved hedge shapes. 3. Use Activity Card TH 2.
Determining the Height	Given a hedge which needs pruning, a yardstick and a rubberband, the student will be able: 1. to use a yardstick and rubber band to insure an even height when trimming hedges.	1. Review use of the yardstick. 2. Select a hypothetical height for a hedge and demonstrate how the rubber band marking will enable the student to keep a consistent height. 3. Use Activity Card TH 3. 4. Discuss the reasons for desired heights of hedges. 5. Have students decide how high hedges in certain areas should be.

Evaluation	Tools, Equipment and Supplies
1. teacher observation 2. class discussion 3. student answers to questions on Activity Card TH 1	1. paper 2. pencil
1. student response to questions on Activity Card TH 2 2. teacher observation	1. paper 2. pencil
1. teacher observation	1. yardstick 2. rubber band

Unit of Instruction	Student Objectives	Suggested Learning Activities
Trimming the Top of the Hedge	Given a yardstick with a rubber band marker, hedge trimmers, work gloves, and a hedge which needs trimming, the student will be able: 1. to determine if the hedge trimmers are in proper working condition. 2. to trim the top of a hedge at a prescribed height. 3. to remove trimmed branches which have fallen into the hedge.	1. Review methods of checking equipment to insure proper working order. 2. Demonstrate to the student the method of using the yardstick to check height. 3. Use Overhead Master 1. 4. Have students observe while you demonstrate trimming a few feet of the top of a hedge. Students may then use the yardstick to check the height. 5. Use Activity Card TH 4. 6. Discuss the importance of removing trimmed branches.
Trimming the Sides of the Hedge	Given hedge trimmers, work gloves, a rake, and a hedge which needs trimming, the student will be able: 1. to select one of three approved hedge shapes. 2. to properly trim the sides of the hedge in this shape. 3. to clean up the site after trimming.	1. Review the three approved hedge shapes. 2. Use Overhead Master 2. 3. Review methods of checking equipment to insure proper working condition. 4. Use Activity Card TH 5. 5. Have students observe while you trim a few feet of the sides of a hedge. 6. Demonstrate use of the rake for removing debris.

Evaluation	Tools, Equipment and Supplies
1. teacher observation 2. check for correct height	1. yardstick with rubber band marker 2. hedge trimmers 3. work gloves
1. teacher observation	1. hedge trimmers 2. work gloves 3. rake

Determining Why Hedges Need Trimming

GET: paper
pencil

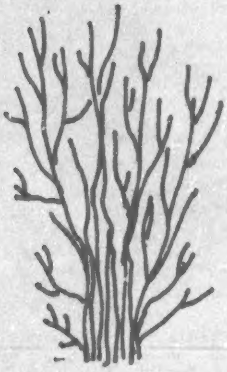
DO: 1. Identify a hedge which needs trimming. You can tell if the hedge needs trimming by looking at its shape.

2. You trim a hedge for two reasons.

A. To make sure that it has a nice shape and good growth.

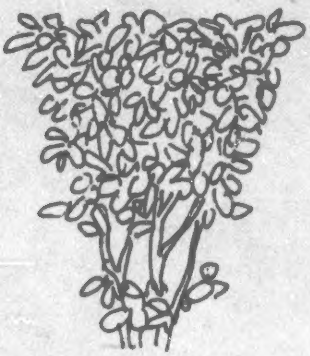
B. To make sure that all of the branches can get sun and rain.

3. List on your paper why each of these hedges needs trimming. Put down an A or a B to show the reason.



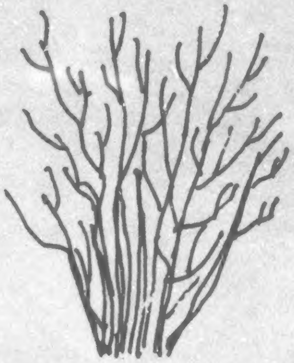
Answer = A

For a nice shape



Answer = B

For sun and rain



Answer = A

For good growth

NOW: 1. List on your paper the reasons why we trim hedges.

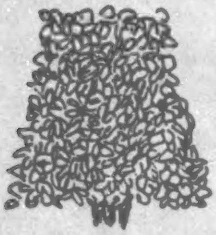
NEXT: Go to Activity Card TH 2.

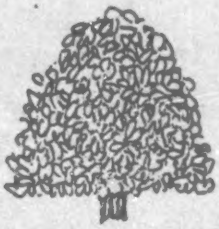
Determining the Shape of a Hedge

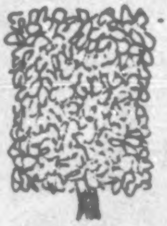
GET: paper
pencil

DO: 1. List on your paper the reasons for trimming hedges. Check your answers with Activity Card TH 1.

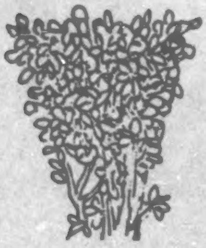
2. There are three shapes that a properly trimmed hedge can take. Remember: The bottom of the hedge should never be narrower than the top.

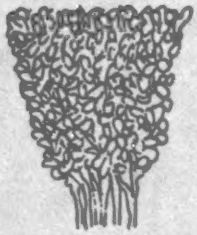


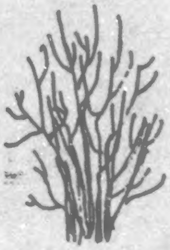




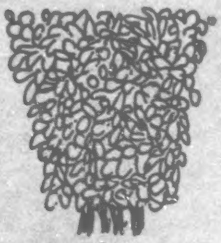
3. Look at the hedges below. List on your paper how they should be trimmed.



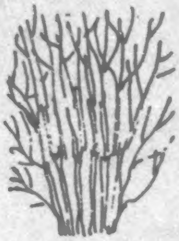




4. Which of these hedges is properly trimmed?



A



B

5. If your answer is Hedge B, then you are right. List on your paper the reasons why Hedge A is not trimmed correctly.

NOW: 1. Have your teacher check your work.

NEXT: Go to Activity Card TH 3.

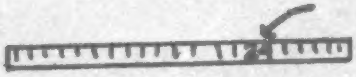
Determining the Height

GET: a yardstick
a rubber band

DO: 1. Look at the hedge that you have decided to trim. Before you trim the sides of the hedge, you must trim the top. Have your teacher help you decide how tall the hedge should be.

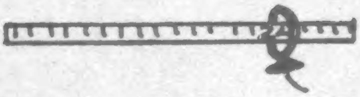
2. Get a yardstick. Find the number on the yardstick for the height of the hedge.

Example - Pretend that your teacher said that the hedge should be 24 inches high. You should then find 24 on the yardstick.



YARDSTICK

3. Put a rubber band on the yardstick at the number your teacher suggested.



RUBBER BAND

The rubber band will make it easier for you to keep the hedge at the right height.

NOW: 1. You are ready to trim the hedge to the right height.

NEXT: Go to Activity Card TH 4.

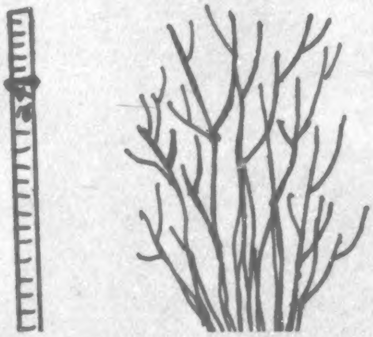
Trimming the Top of the Hedge

GET: the yardstick with the rubber band marker
hedge trimmers
work gloves

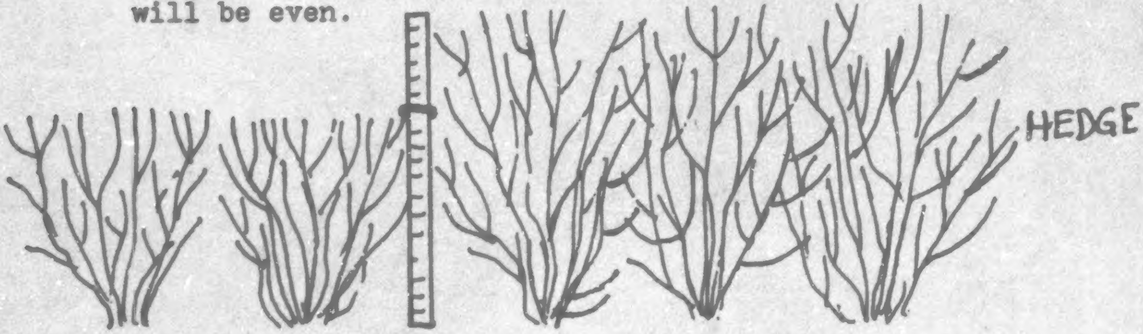
DO:

1. Check the hedge trimmers to be sure that they are sharp and oiled. If they are not in good condition, see your teacher. Remember to wear your work gloves.

2. Take the yardstick, gloves and hedge trimmers to the hedge you will be trimming. Stand the yardstick next to the hedge. You will trim the hedge at the same height as the rubber band.



3. Begin to trim the top of the hedge. Use the yardstick to check the height. Do this at about each foot along the hedge. By doing this, you will be sure that the hedge top will be even.



4. Continue trimming the top of the hedge.

NOW:

1. Check with your teacher to see how you have done.

2. Brush off the hedge with your hand to remove any cut branches which did not fall to the ground.

NEXT: Go to Activity Card TH 5.

Trimming the Sides of the Hedge

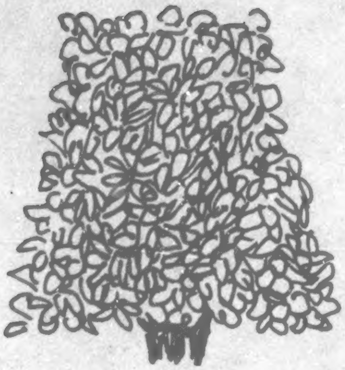
GET: hedge trimmer
work gloves
rake

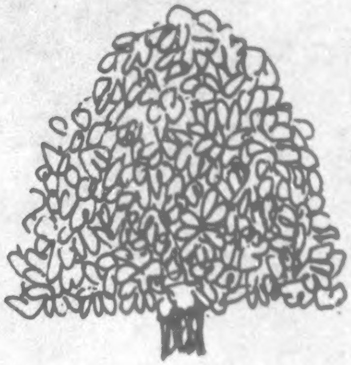
DO:

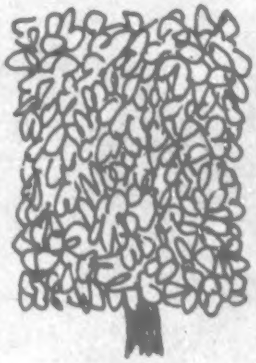
1. Check the hedge trimmers to be sure that they are sharp and oiled. If they are not in good condition, see your teacher.

   Remember to wear your work gloves.

2. Discuss with your teacher and then decide which shape your hedge will take. Remember, you may choose from any of these three:







3. Begin trimming the hedge sides. You will have to stop every foot or so to check your progress.

4. Continue trimming the sides of the hedge.

NOW:

1. You have finished trimming the hedge.

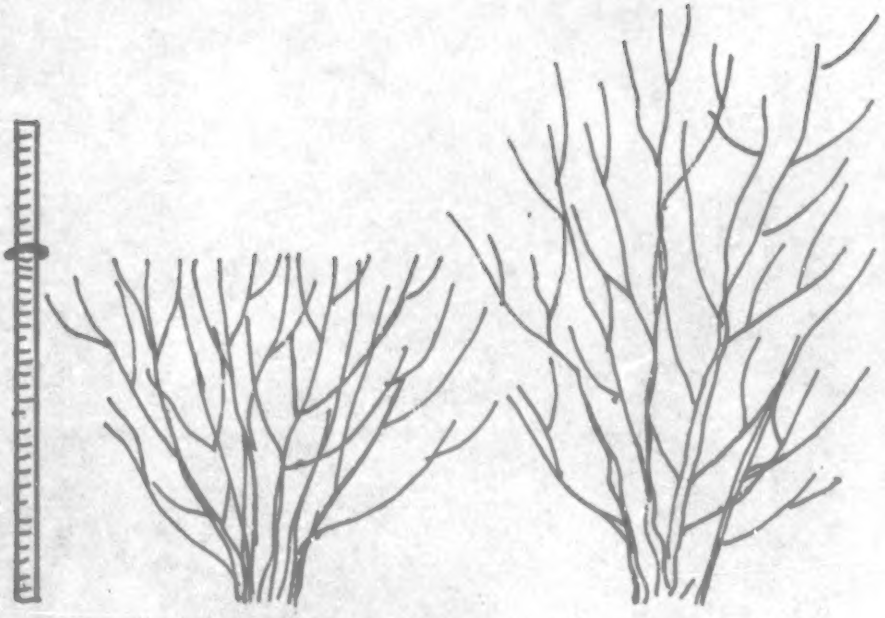
2. Clean up the area by raking or picking up all of the twigs on the ground.

3. Return your tools.

NEXT: See your teacher.

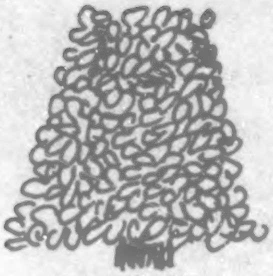
Overhead 1

CHECKING THE HEIGHT

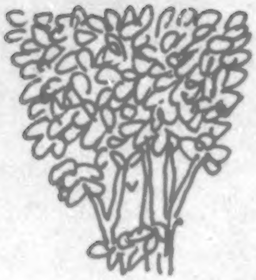


Overhead 2

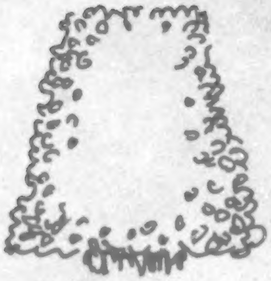
APPROVED HEDGE SHAPES



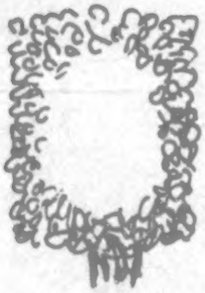
RIGHT



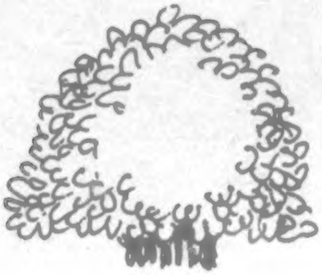
WRONG



RIGHT



RIGHT



RIGHT

Appendix 16

JOB TITLE: Gardening
Groundskeeping

DUTY: Maintaining Plants

TASK: Edging Flower Beds

Activities:

1. Purposes of Edging
2. Gathering Materials for Edging
3. Removing the Sod
4. Laying the Edging

PREREQUISITE SKILLS AND KNOWLEDGE

This module on edging flower beds will give students experience in gardening and groundskeeping. While its instructions are precise, they do not provide all essential prerequisite knowledge for the student. A list of prerequisite knowledge follows:

1. knowledge of safety precautions
2. use of spade
3. use of yardstick
4. knowledge of plant and sod growth

VOCABULARY

The teacher should review these words with the student:

EDGE

BED

OVERGROWN

MATERIAL

PROPER

WHEELBARROW

SOD

CONDITION

TWINE

REMOVE

PROGRESS

A CURRICULUM GUIDE FOR

Edging Flower Beds

Unit Of Instruction	Student Objectives	Suggested Learning Activities
Purpose of Edging	Given a pencil and paper, the student will be able: 1. to state two reasons for edging flower beds. 2. to correctly identify a properly edged bed.	1. Discuss the purpose of edging. 2. Discuss with students the aesthetic value of edging. 3. Show the students examples of properly edged beds in the community. 4. Explain how overgrown edges damage plant roots. Allow the students to examine samples of damaged plants. 5. Have the students build mock-ups of properly edged beds. 6. Use Activity Card E 1.
Gathering Materials for Edging	Given a ball of twine, a wheelbarrow, work gloves, spade, edging material, yardstick, and two sticks, the student will be able: 1. to assemble necessary materials at the bed site. 2. to identify a spade from other types of shovels. 3. to ascertain that the tools to be used are in good condition.	1. Show students where the materials are stored. 2. Inform students of safety precautions. 3. Discuss with students the importance of wearing gloves. 4. Explain the difference between the type of spade used for edging and other shovels. 5. Have students illustrate the proper use of the spade. 6. Use Activity Card E 2.

Evaluation	Tools, Equipment and Supplies
1. correct answers on Activity Card 2. teacher observation	1. paper 2. pencil 3. samples of damaged plants
1. teacher observation	1. ball of twine 2. wheelbarrow 3. work gloves 4. spade 5. edging material 6. yardstick 7. two stakes

Unit of Instruction	Student Objectives	Suggested Learning Activities
Removing the Sod	Given a ball of twine, a wheelbarrow, work gloves, spade, edging materials, yardstick and 2 stakes, the student will be able: 1. to prepare the area for edging. 2. to demonstrate proper use of spade for cutting through sod. 3. to successfully edge and remove sod in preparation for laying edging material.	1. Demonstrate pounding stakes into the ground and tying the twine to the stake. 2. Demonstrate correct use of the spade. 3. Have the students practice digging with a spade. 4. Have the students illustrate sod and placement of spade. 5. Discuss why sod should be picked up and put in wheelbarrow. 6. Use Activity Card E 3.
Laying the Edging	Given edging material, yardstick, wheelbarrow, and work gloves, the student will be able: 1. to successfully lay edging material. 2. to use yardstick to measure placement of edging material. 3. to properly clean area.	1. Demonstrate laying edging and securing it with soil. 2. Have students practice laying edging. 3. Review measuring with yardstick. 4. Discuss clean up procedures. 5. Use Activity Card E 4.

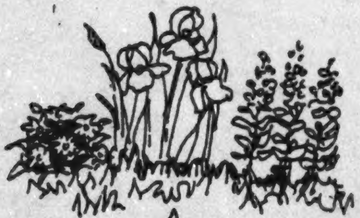
Evaluation	Tools, Equipment and Supplies
1. teacher observation	1. ball of twine 2. wheelbarrow 3. work gloves 4. spade 5. edging material 6. yardstick 7. two sticks
1. teacher observation	1. edging material 2. yardstick 3. wheelbarrow 4. work gloves

Purpose of Edging

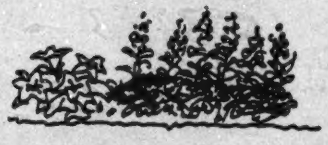
GET: paper
pencil

DO:

1. Sometimes grass and weeds grow into flower beds. This makes the bed look messy. Overgrown edges can also hurt plant roots.
2. We edge flower beds to:
   a. make them look nice and neat
   b. protect plant roots
3. List on your paper two reasons for edging flower beds.
4. Look at these beds. Which one should be edged? Put answer A or B on your paper.



A



B

NOW: 1. Have your teacher check your answers.

NEXT: Go to Activity Card E 2.

Gathering Materials for Edging

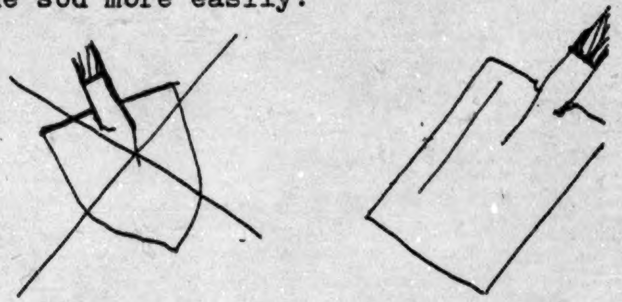
GET:
ball of twine
wheelbarrow
work gloves
spade
edging material
yardstick
2 stakes

DO:

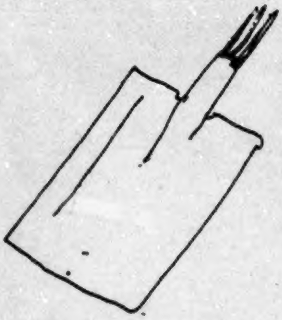
1. Check with your teacher on the type of edging material you will be using. There are many types of edging. Your teacher will help you select the proper one.

2. Gather the materials you will need and take them to the flower bed.

3. The spade that you will use has a sharp, straight edge. Because the edge is straight and sharp, it will cut the sod more easily.



4. Check the tools to see that they are in good condition.



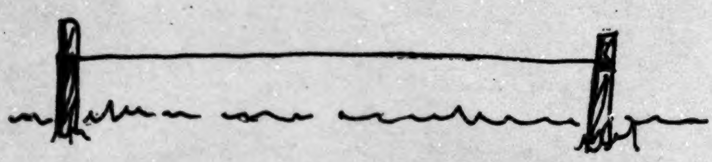
NOW: 1. You are ready to begin edging.

NEXT: Go to Activity Card E 3

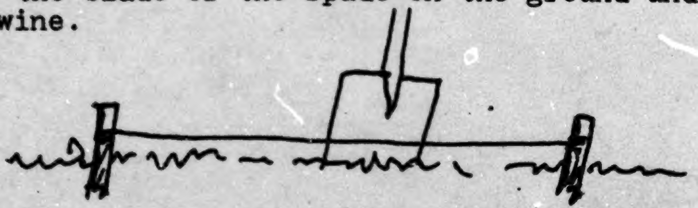
Removing the Sod

GET: materials from Activity Card E 2
put on your work gloves

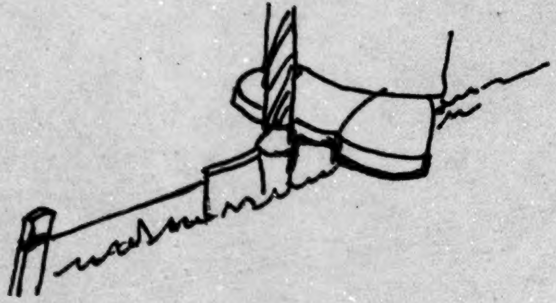
DO: 1. If the edge is to be straight, pound one stick into the ground at each end. Be sure that they are even. Tie the twine to each stick.



2. Place the blade of the spade on the ground under the twine.

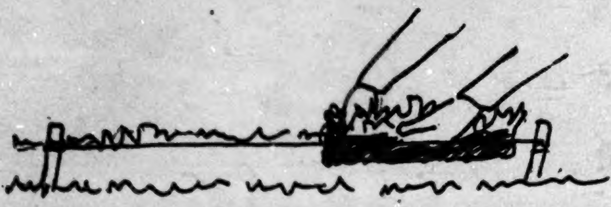


3. Press down on the spade with your foot. Be sure that the spade cuts through all of the sod.



4. Continue cutting through the sod.

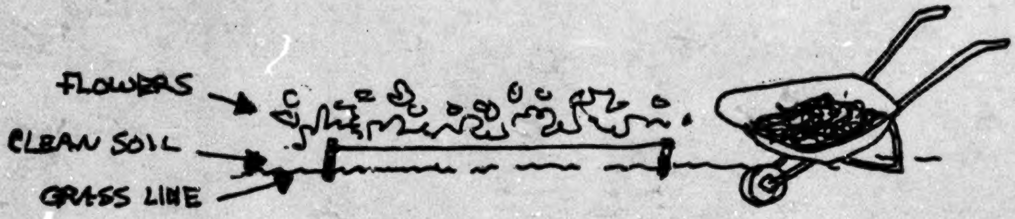
5. Now pick up the loosened sod. Shake the dirt off of it. Put it in the wheelbarrow.



Removing the Sod

(Continued)

6. Continue to remove the sod.


FLOWERS
CLEAN SOIL
GRASS LINE

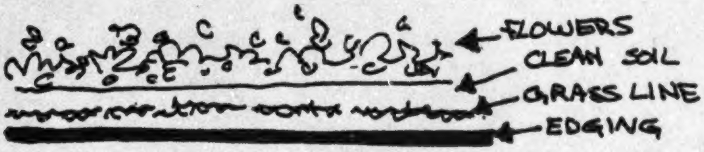
NOW: 1. Have your teacher check your progress.

NEXT: Go to Activity Card E 4

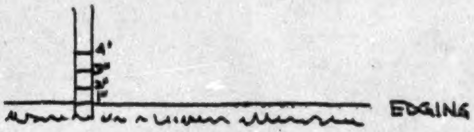
Laying the Edging

GET: materials from Activity Card E 2

DO: 1. Take the edging that your teacher has selected and begin to place it at the edge of the bed.

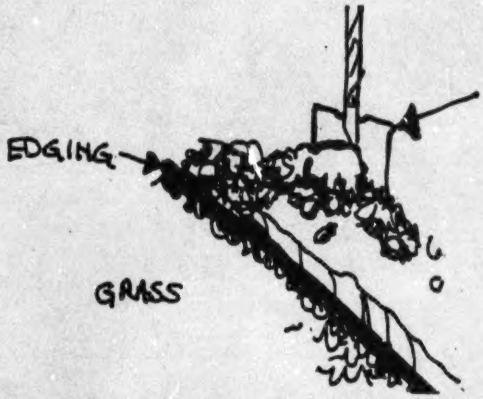

FLOWERS
CLEAN SOIL
GRASS LINE
EDGING

2. Sink the edging material into the ground. Leave 1 inch sticking up above the grass. Use your yardstick to measure 1 inch.



3. Continue laying the edging.

4. Now, push some soil up against the edging to hold it in place.


EDGING
GRASS

NOW: 1. Pick up your tools and clean up the area.

2. Have your teacher check your work.

NEXT: See your teacher.

JOB TITLE:	Gardening Groundskeeping
DUTY:	Maintaining Plants
TASK:	Thatch Control
Activities:	1. Recognizing Thatch
	2. Raking
	3. Aerating Soil
	4. Preventing Thatch

PREREQUISITE SKILLS AND KNOWLEDGE

This module on thatch control will give students experience in a particular area of lawn maintainance. It teaches thatch removal, basic aeration, and use of proper mowing procedures for thatch prevention. While the module's purpose is teaching students, there is prerequisite knowledge which students should have. A list of these skills follows:

1. use of rake
2. use of power mower
3. knowledge of mowing safety

VOCABULARY

THATCH

CLIPPINGS

NEAT

WHEELBARROW

AERATOR

AERATION

SPIKED ROLLER

A CURRICULUM GUIDE FOR

Thatch Control

Unit Of Instruction	Student Objectives	Suggested Learning Activities
Recognizing Thatch	Given a pencil and paper, and an area of lawn, the student will be able: 1. to understand why thatch is harmful. 2. to demonstrate recognition of thatch, both in a drawing and in a lawn area.	1. Discuss with students how thatch can hurt a lawn and why it should be removed. 2. Show the students plugs of real turf, with and without thatch. 3. Have the students illustrate how thatch builds up gradually. 4. Use Activity Card TC 1.
Raking	Given work gloves, a heavy iron rake, and a wheelbarrow, the student will be able: 1. to successfully rake thatch from a lawn area. 2. to clean up the site and return his tools.	1. Explain to the students why work gloves are needed. 2. Demonstrate correct use of the rake. 3. Discuss why the heavy rake is used instead of a lawn broom. 4. Use Activity Card TC 2.
Aerating Soil	Given an aerator, the student will be able: 1. to understand the purpose of aeration. 2. to successfully aerate a lawn area.	1. Discuss with students the purpose of aeration in an area that has had heavy thatch. 2. Demonstrate how to use the areator. 3. Show the students other types of aeration equipment. 4. Use Activity Card TC 3.

Evaluation	Tools, Equipment and Supplies
1. correct answers on Activity Card 2. teacher observation	1. pencil 2. paper
1. teacher observation	1. work gloves 2. heavy iron rake 3. wheelbarrow
1. teacher observation	1. aerator

Unit of Instruction	Student Objectives	Suggested Learning Activities
Preventing Thatch	Given a power mower and a grass catcher, the student will be able: 1. to explain how proper mowing practice can prevent thatch build up. 2. to successfully mow a lawn area. 3. to clean up the site and put away tools.	1. Discuss why mowing often with shorter clippings can help prevent thatch. 2. Have the students determine when a grass catcher should be used. 3. Review safety precautions with power mowers. 4. Have the students make a list of good mowing procedures for review. 5. Use Activity Card TC 4.

Evaluation	Tools, Equipment and Supplies
1. teacher observation	1. power mower 2. grass catcher

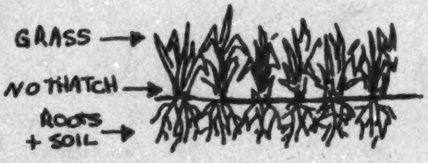
Recognizing Thatch

GET: pencil
paper

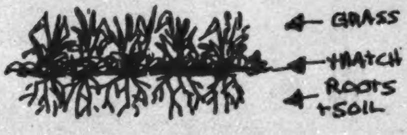
DO:

1. Thatch forms when dead grass and clippings build up on the soil. This thick mat may keep water and air from the soil. It is a good growing place for insects and disease. Thatch may cause the grass to die.

2. Look at these drawings. Which lawn shows thatch build-up?


GRASS
NO THATCH
ROOTS + SOIL

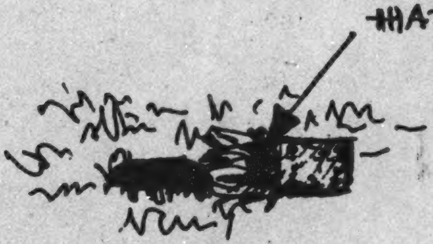
A


GRASS
THATCH
ROOTS + SOIL

B

3. List two reasons that thatch build-up harms lawns.

4. With your teacher's help, find a lawn area with thatch.



NOW:

1. Have your teacher check your answers.
2. You are ready to begin raking.

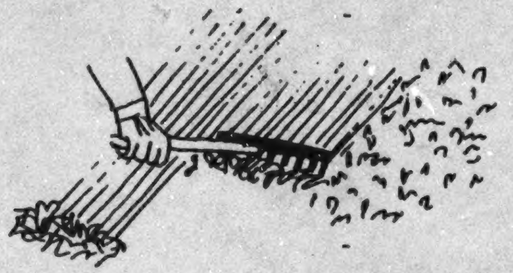
NEXT: Go to Activity Card TC 2

Raking

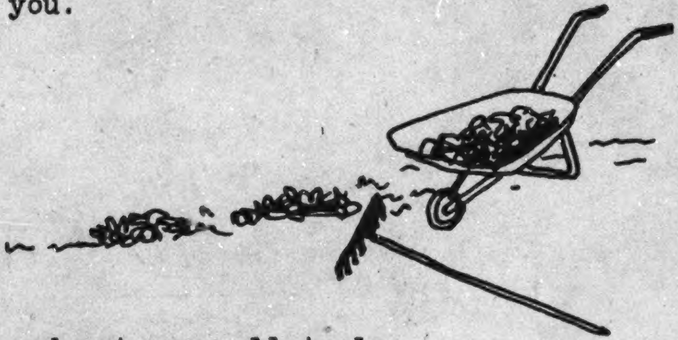
GET: work gloves
heavy iron rake
wheelbarrow

DO:

1. Put on your work gloves.
2. Start raking the area of thatch you found earlier. Your rake should pull out the dead grass and leaves. Be careful not to hurt the healthy grass.
3. You should rake in rows. That way you will be sure to get all the thatch.



4. As you rake, make piles of thatch.
5. When you are done raking, pick up the piled thatch. Put it in the wheelbarrow. Dump it where your teacher tells you.



NOW:

1. Clean and put away all tools.
2. Have your teacher check your work.

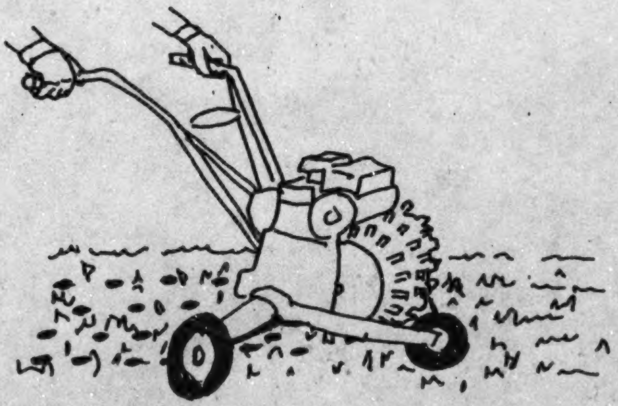
NEXT: Go to Activity Card TC 3

Aerating Soil

GET: Aerator (spiked roller)

DO:

1. Too little water and air in the soil may be the result of heavy thatch.
2. To help the soil breath again, it helps to punch holes in it. This is called aeration.
3. Begin to push the spiked roller across the thatched area. Notice the holes you are making in the soil.
4. Finish rolling the raked area.



NOW: 1. Clean and put away all tools.

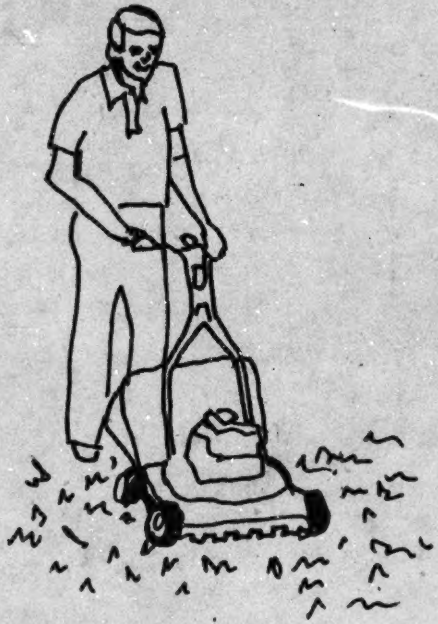
NEXT: Go to Activity Card TC 4.

Preventing Thatch

GET: power mower
grass catcher

DO:

1. Remember, thatch build up can often be prevented by good mowing practices.
2. Mowing often and removing heavy clippings will help control thatch.
3. Attach the grass catcher to the power mower. Your teacher will help you set the mower blade.
4. Show that you remember how to cut grass. Start the mower, and mow the area assigned by your teacher.



NOW: 1. Clean and put away all tools.

NEXT: See your teacher.

Appendix 18

JOB TITLE: Maintaining and Repairing Electrical Systems

DUTY: Maintain the Starting System

TASK: Service the Battery

ACTIVITY: Measure the Specific Gravity of the Battery

PREREQUISITE SKILLS AND KNOWLEDGE

This module directs the student to perform numerous tasks. It is assumed that the student has certain basic knowledge and skills that are essential for the successful completion of these activity cards. The prerequisite knowledge and skills are as follows:

1. Precautions to follow when working with corrosive liquids.
2. First aid for acid burn victims.

VOCABULARY

The teacher should review these words with the student:

BATTERY

ELECTROLYTE

SULFURIC ACID

VENT PLUG

CELL

VENT RING

PLATES

HYDROMETER

TUBE

BULB

BARREL

FLOAT

SPECIFIC GRAVITY

SCALE

TEMPERATURE CORRECTION

A CURRICULUM GUIDE FOR

Measure the Specific Gravity
# of the Battery

Unit Of Instruction	Student Objectives	Suggested Learning Activities
Measure the Specific Gravity of the Battery	Given an automobile battery in an unknown state of charge, the student will be able:	
	1. to check the electrolyte level in each cell	1a. Show the student how to visually estimate that the electrolyte is sufficiently high to make a hydrometer reading. 1b. Show that adding unnecessary water will cause a low specific gravity reading.
	2. to draw a sample of electrolyte from each cell.	2a. Demonstrate the insertion of the hydrometer tube through the battery vent to reach the top of the plates. 2b. Have the students practice drawing electrolyte samples until they can fill the tube to the proper level.
	3. to read and record the specific gravity of the electrolyte from each battery cell with a hydrometer.	3. Demonstrate the reading of the hydrometer scale. Have the students practice with a battery of known readings.
	4. to correct the specific gravity readings for variations in temperature.	4. Explain that the hydrometer float is correct only at 80°F. and that corrections are required at other electrolyte temperatures. Show how to make corrections.
	5. to determine the operating condition of the battery.	5. Demonstrate and have the students determine the condition of a number of shop batteries.
	6. to recommend corrective action if the battery cell specific gravities are low or uneven.	6. Explain the criteria and have the students determine whether shop batteries are serviceable or require charging or replacement.

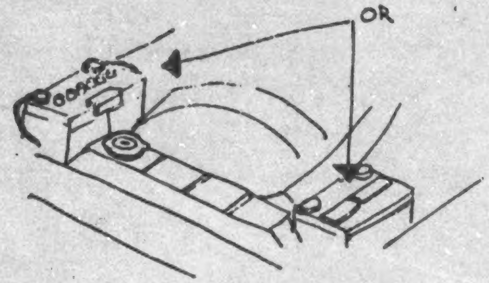
Evaluation	Tools, Equipment and Supplies
1. Check that the students practice battery has sufficient fluid to float the hydrometer and that the student does not add water until after the hydrometer readings are taken. 2. Check that the student draws an amount of fluid that will raise the float from the bottom of the tube without the float resting against the top of the tube. Check that the float does not have air bubbles attached or trapped below. 3. Check that the student holds the hydrometer vertically with the float free of the sides of the tube and the fluid at eye level. 4. Check that the student checks the final specific gravity readings for temperature difference. 5. Check that the student's record of cell readings are within ± .005 of the instructor's readings. 6. The student's recommedations should agree with the instructor's determination.	old automobile batteries hydrometer pencil & paper distilled water

Measure the Specific Gravity of the Battery

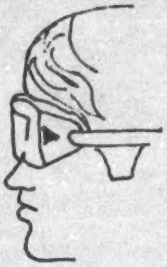
GET: Equipment:
1. battery hydrometer
2. paper and pencil

DO: 1. Open the hood of the automobile.

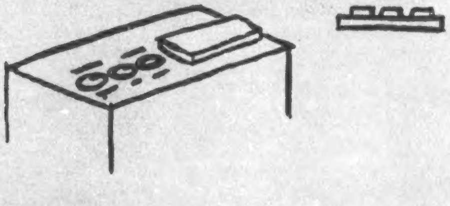
2. Locate the battery either to the right or to the left side of the radiator.



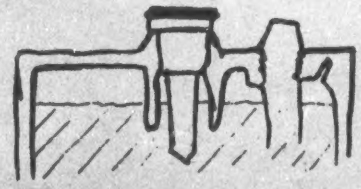
3. Put on your safety goggles.



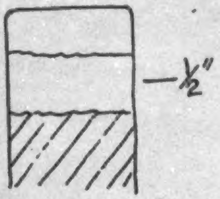
4. Remove the vent plugs from the top of the battery.
Warning: Use care not to get battery acid on your hands or clothing. The acid will cause painful burns on the skin and will make holes in your clothing.



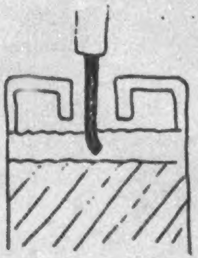
5. Check that the electrolyte level in each cell is above the top of the plates in the battery.



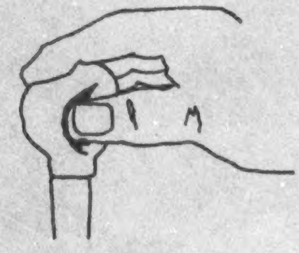
6. If the electrolyte level is below the top of the plates, add only enough water to bring the level about 1/2 inch above the plates in that cell.



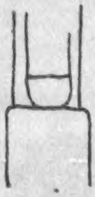
7. Place the top of the battery hydrometer into the fluid of the first cell.



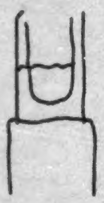
8. Squeeze the bulb gently and release.



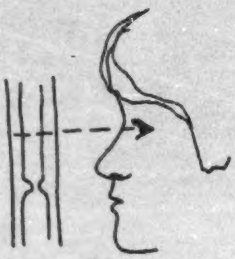
9. If the float does not rise from the bottom of the glass barrel, squeeze the bulb more firmly and release again.



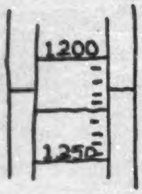
10. If enough electrolyte is drawn into the glass barrel to raise the float, remove the hydrometer from the battery cell.



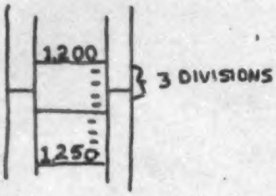
11. Hold the hydrometer at eye level and read the specific gravity.



12. Read the first number on the scale that is above the level of the electrolyte.



13. Count the small divisions on the scale from the number downward to the electrolyte level.



14. Multiply the number of small divisions by .005.

EXAMPLE : 3 DIVISIONS X .005 = .015

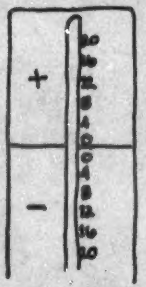
15. Add the number from step 14 to the number from step 12.

EXAMPLE: .015 + 1.200 = 1.215

16. Write this number on your paper for cell number 1.

1	2	3	4	5	6
1.215					

17. Read the temperature correction from the scale in the bottom of the hydrometer barrel.



18. Record the temperature correction on your paper.

1	2	3	4	5
1.215				

TEMP. CORRECTION +6

19. Do steps 7 through 16 for each of the cells in the battery, 2 through 6.

1	2	3	4	5	6
1.215	1.210	1.195	1.210	1.130	1.205

TEMP. CORRECTION +6

20. Add (or subtract) the temperature correction to each reading on your paper.

1	2	3	4	5	6
1.215	1.210	1.195	1.210	1.130	1.205
+ 6	+ 6	+ 6	+ 6	+ 6	+ 6
1221	1.216	1.201	1.216	1.136	1.211

TEMP. CORRECTION +6

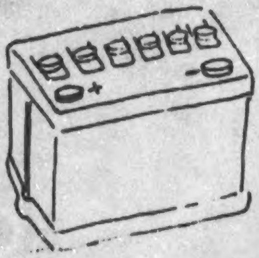
21. Find the lowest cell reading on your paper.

22. If the lowest reading is below 1.150, the cell is dead and the battery should be replaced.

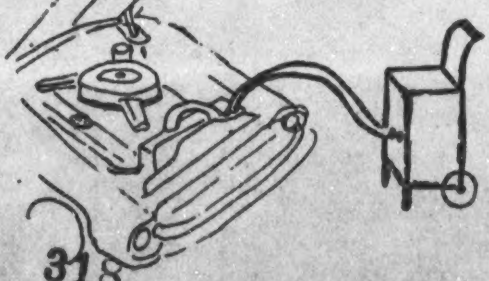
23. Subtract the lowest cell reading from the highest cell reading on your paper.

EXAMPLE: 1.215 − 1.130 = .085

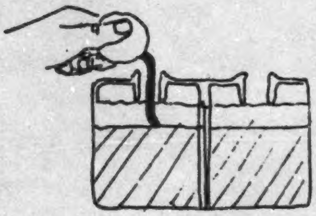
24. If the lowest reading is .050 or more below the highest cell reading, the low cell is dead and the battery should be replaced.



25. If the cell readings are below 1.220, the battery is discharged and should be charged (specific gravity of 1.260-1.280) with the shop battery charger.



26. Add water to each cell to bring the level of the electrolyte up until it touches the bottom of the vent ring.



NOW: 1. Discuss your measurements and findings with your instructor before replacing or charging the battery.

Appendix 19

JOB TITLE: Engine Tune-Up Specialist

DUTY: Routine Maintenance

TASK: Inspect and Replace the Air Cleaner Filter Elements

ACTIVITIES:

1. Inspect the Air Cleaner Filter Element
2. Replace the Air Cleaner Filter Element

PREREQUISITE SKILLS AND KNOWLEDGE

This module directs the student to perform numerous tasks. It is assumed that the student has certain basic knowledge and skills that are essential for the successful completion of these activity cards. The prerequisite knowledge and skills are as follows:

1. Determination of replacement part numbers for carburetor, air filter and crankcase breather filter element.

VOCABULARY

The teacher should review these words with the students:

AIR CLEANER SHELL

WING NUT

FINGER TIGHT

AIR FILTER ELEMENT

CRANKCASE VENTILATION FILTER ELEMENT

CRANKCASE VENTILATION FILTER PACK

A CURRICULUM GUIDE FOR

Inspect and Replace the Air Cleaner Filter Elements

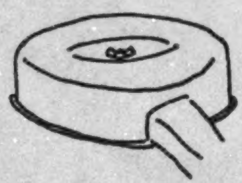
Unit Of Instruction	Student Objectives	Suggested Learning Activities
Inspect the Air Cleaner Filter Elements	Given an automobile, the student will be able:	
	1. to identify and remove the air filter element and the crankcase ventilation filter element from the air cleaner shell.	1. Demonstrate access and removal of filter elements from different types of automobiles in the shop.
	2. to determine if the filter elements are serviceable or require replacement.	2. Demonstrate the difference in light diffusion through a "dirty" air filter and a clean filter element.
		3. Demonstrate the technique of knocking loose dirt from the filter before testing.
		4. Have the students make judgements on individual air filters in a mixed lot of clean and dirty air filters.
		5. Use Activity Card AC 1.
Replace the Air Cleaner Filter Elements	Given an automobile, the student will be able:	
	1. to place serviceable filter elements in the air cleaner.	1. Demonstrate correct location and placement of filter elements in an air cleaner shell.
	2. to return the air cleaner to running configuration.	2. Demonstrate "finger tight" adjustment of the wing nut which will hold the air cleaner shell securely in place without deforming the air cleaner top.
		3. Use Activity Card AC 2.

Evaluation	Tools, Equipment and Supplies
1. Check that both filter elements have been removed from the air cleaner. 2. Check student's judgement on air cleaner serviceability.	1. drop light
1. Check student placement of filter elements. 2. Check serviced air cleaner for security of mounting. a. Check that wing nut is "finger tight". b. Before approving the job, confirm that none of the hoses or ducts have been disturbed or removed from the air cleaner shell.	1. air filter element 2. crankcase ventilation filter element

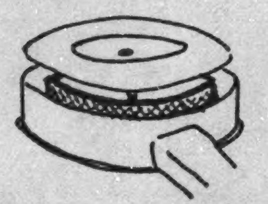
Inspect the Air Cleaner Filter

GET: 1. drop light

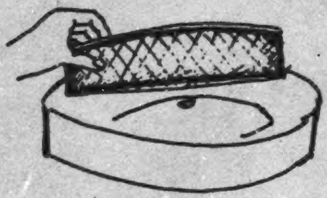
DO: 1. Remove the wing nut from the top of the air cleaner.



2. Remove the top of the air cleaner.

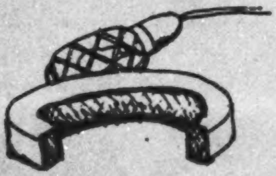


3. Remove the carburetor air filter element from the air cleaner shell.



4. Plug in the drop light.

5. Hold the air filter element up to the drop light. The drop light should be placed next to the outside of the air filter.



Inspect the Air Cleaner Filter
(CONTINUED)

6. Does the filter look clean and does most of the light shine through the filter?

7. If it looks clean and the light shines through, the filter is okay. Keep it.

   If it looks dirty or the light does not shine through the filter, get a new filter.

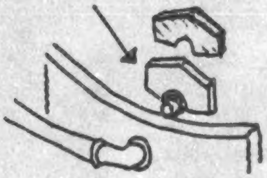
NOW: 1. Discard dirty filters in the waste can.

NEXT: Do Activity Card AC 2.

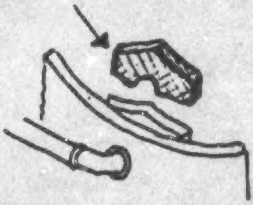
Replace the Air Cleaner Filter Elements

GET:
1. air cleaner filter
2. crankcase ventilation filter (if needed)

DO:
1. Find the small crankcase ventilation filter pack on the side of the air cleaner.



2. Remove the crankcase ventilation filter from the crankcase ventilation filter pack.

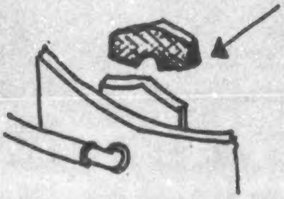


3. Is the crankcase ventilation filter dirty or oily?

4. If the crankcase ventilation filter is not dirty or oily, it is okay. Go to step 7.

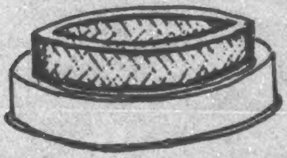
5. If the crankcase ventilation filter is dirty or oily, get a new one.

6. Put the clean crankcase ventilation filter in the crankcase ventilation filter pack.



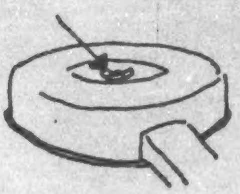
Replace the Air Cleaner Filter Elements
(CONTINUED)

7. Put the clean air filter element in the air cleaner shell.



8. Put the top on the air cleaner.

9. Put the wing nut on the air cleaner stud and tighten finger tight.



NOW: 1. Check air cleaner for proper mounting by gently rocking the air cleaner shell with your fingertips.

NEXT: Have your instructor check your work.

JOB TITLE:	Engine Tune-Up Specialist
DUTY:	Maintenance and Servicing Lubrication System
TASK:	Check Engine Crankcase Oil Level
ACTIVITIES:	1. Locate and Remove Dipstick 2. Check the Engine Crankcase Oil Level

PREREQUISITE SKILLS AND KNOWLEDGE

This module directs the student to perform a single task. It is assumed that the student has certain basic knowledge and skills that are essential for the successful completion of this activity card. The prerequisite skills and knowledge are as follows:

1. Determination of how crankcase engine oil level is measured

VOCABULARY

The teacher should review these words with the student:

OIL DIP STICK

ENGINE CRANKCASE

A CURRICULUM GUIDE FOR

Checking Engine Crankcase Oil Level

Unit Of Instruction	Student Objectives	Suggested Learning Activities
Locating and Identifying Engine Crank-Case Oil Dip Stick	Given an automobile, the student will be able:	
	1. to identify and remove the oil dipstick from the engine.	1. Demonstrate access and removal of dipstick from different types of automobiles in the shop. 2. Demonstrate correct procedure for wiping dipstick with clean rag. 3. Use Activity Card 1.
Check Engine Crankcase Oil Level	Given an automobile, the student will be able:	
	1. to determine the level of oil in the crankcase by correctly reading the dipstick.	1. Indicate type of level marking (empty - full) on dipstick and how to read. 2. Have student read automobile owner's manual to determine manufacturer's specified procedure. 3. Use Activity Card 2.

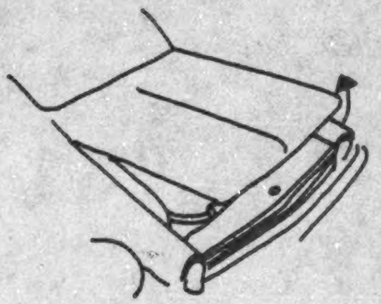
Evaluation	Tools, Equipment and Supplies
1. Check student's procedure in removing, wiping, replacing, and reading oil dipstick per instructor's and manufacturer's standards.	1. suitable waste rag or cloth

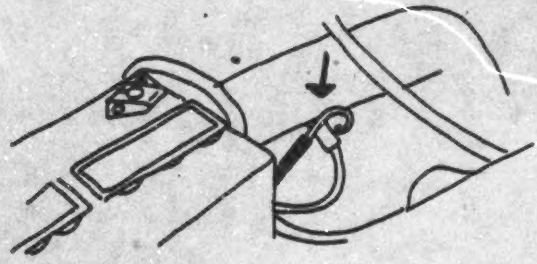
Locate and Remove Dipstick

GET: 1. clean waste rag cloth or similar item to wipe oil from dipstick

DO:

1. Turn off the engine if in operation. Wait 3 or 4 minutes after turning off car. Automobile should be level.
2. Raise engine hood.
3. Locate oil dipstick on left or right side of engine depending on make of automobile.
4. Identify dipstick according to markings, teacher's instructions, and manufacturer's owner's manual.





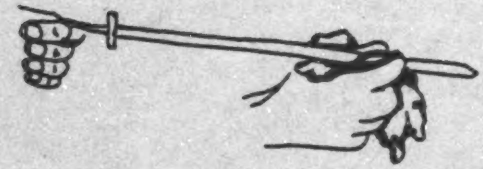
NEXT: 1. Go to Activity Card 2

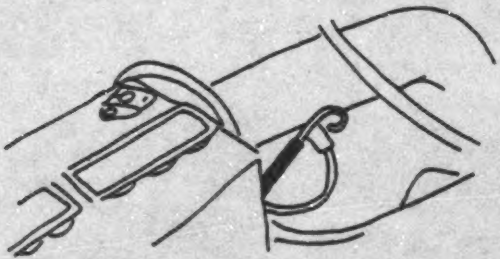
Checking Engine Crankcase Oil Level

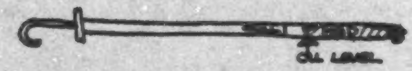
GET: 1. clean waste rag

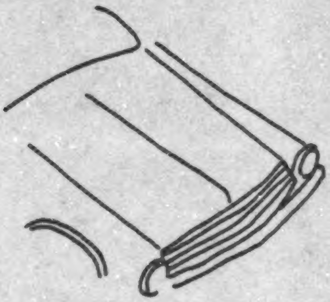
DO: 1. Pull out dipstick and wipe dry with clean cloth.

2. Put dipstick back into the engine as far as possible.
3. Pull out dipstick and take reading.
4. Replace dipstick in engine again.
5. Close hood carefully when through.









NOW: 1. Discard oily rag in proper container.

Appendix 21

JOB TITLE:	Tire Maintenance Specialist
DUTY:	Maintaining and Servicing Automobile Tires
TASK:	Check Automobile Tire Air Pressure
ACTIVITY:	Check Automobile Tire Air Pressure

PREREQUISITE SKILLS AND KNOWLEDGE

This module directs the student to perform a single task. It is assumed that the student has certain basic knowledge and skills that are essential for the successful completion of this activity card. The prerequisite knowledge and skills are as follows:

1. Determination of how tire pressure is measured

VOCABULARY

TIRE SIDEWALL

PSI

INFLATION - OVER
- UNDER
- PROPER

PRESSURE GAUGE - HIGH
- LOW

VALVE STEM

VALVE STEM CAP

BLEED

A CURRICULUM GUIDE FOR

Checking Automobile Tire Air Pressure

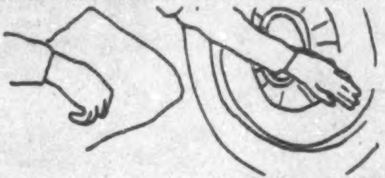
Unit Of Instruction	Student Objectives	Suggested Learning Activities
Check Automobile Tire Air Pressure	Given an automobile, the student will be able to:	
	1. Demonstrate the correct procedure for checking tire pressure.	1. Demonstrate correct procedure for determining tire pressure with pressure gauge.
	2. Demonstrate the correct use of a tire pressure gauge.	2. Identifying types of pressure gauges.
		3. Have student practice reading different types of pressure gauges.
		4. Use Activity Card TP 1.

Evaluation	Tools, Equipment and Supplies
1. Check student's procedure in removing valve stem cap, correct use of pressure gauge, and correct reading of pressure gauges, per instructor's and automobile manufacturer's standards.	1. proper tire pressure gauge 2. rag or waste cloth 3. Valve stem caps if necessary or needed

Checking Automobile Tire Pressure

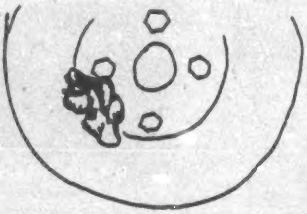
GET: 1. Clean rags or waste cloth and correct tire pressure gauge.

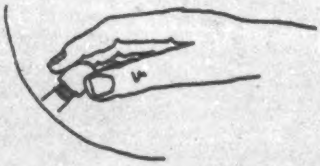
DO: 1. Feel side wall of tire to be sure tire is cold, not hot.



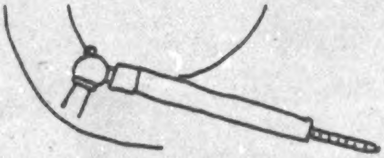
2. With clean rag or cloth, wipe off any dirt or dust from valve stem and cap.

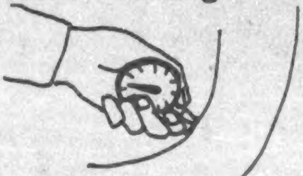
3. Loosen and remove valve stem cap.



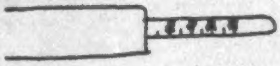


4. Place tire pressure gauge on valve stem, according to correct procedures to take pressure reading.





5. Remove pressure gauge and determine tire pressure by reading gauge.



6. Replace valve stem cap on valve if tire pressure is satisfactory.

NOW: 1. Replace and store rags in proper container.